# LUMINATING ENGINEER

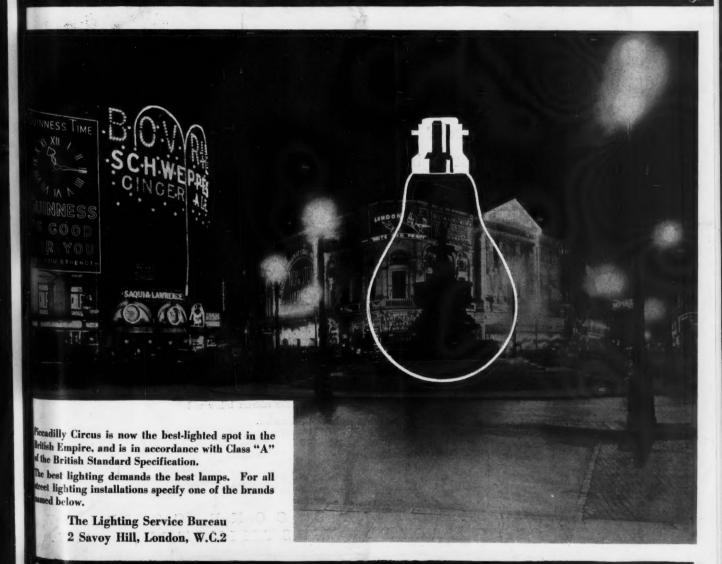
XXV

PRESIDENTIAL ADDRESS, by HAROLD DAVIES ...

October 1932

Price 9d.

			- 1	NU	LX	
				PAGE		PAGE
Editorial Notes :					THE ADMINISTRATION OF PUBLIC LIGHTING	241
Public Lighting		•••	•••	233	Discussion	243
Notes and News on Illumination	***			234	Public Lighting in Colchester, by H. Collins	244
				. 9	STREET LIGHTING BY GAS IN BURNLEY, by J. H. Clegg	247
ASSOCIATION OF PUBLIC LIGHTING ENG	INEERS :					
Ninth Annual Meeting and Conference in	Blackpo	ool:			STREET LIGHTING OF OLDHAM, by I. H. Massey	250
GENERAL ACCOUNT OF PROCEEDINGS		***	•••	235	EXHIBITION OF PUBLIC LAMPS AND LIGHTING EQUIPMENT	253
ANNUAL GENERAL MEETING	•••		***	236	Directory of Lighting Equipment	268



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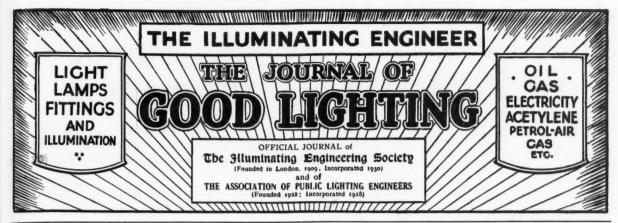
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Vol. XXV

October, 1932

Price NINEPENCE iption 10/6 per annum, post free

Edited by

J. STEWART DOW

**EDITORIAL AND PUBLISHING OFFICES:** 32 VICTORIA STREET, LONDON, S.W.1.

Tel. No.: Victoria 5215

# **Public Lighting**

THE ninth Annual Conference of the Association of Public Lighting Engineers in Blackpool was, by general consent, a successful one. We give elsewhere a full account of the proceedings, and only wish here to touch on one or two salient points.

Let us first congratulate the new President, Mr. Harold Davies, on this success, and on the varied and interesting series of papers presented—secured in a great measure through his personal efforts. His own address and the three contributions dealing with the lighting of Colchester, Burnley and Oldham aptly illustrated lighting conditions typical of average towns, where lighting is in the main well handled, but where the resources of great cities are absent. These are the lighting conditions which, as the President remarked, are found in nine-tenths of the towns in charge of members of the Association, and the experience summarized by Messrs. Collins, Clegg and Massey therefore serves as a

Secondly, we may refer to the outstanding success scored by the two papers prepared respectively by Mr. F. C. Smith and by Mr. G. H. Wilson. Despite the apparently complex nature of the material, these papers attracted what was probably a record attendance. Both must have involved an immense amount of work; yet both authors succeeded in presenting the essence of the subject-matter in a lucid and entertaining manner and in rendering such relatively novel constructions as the "isocandle" diagram interesting to those present. It was pleasant also to find two representatives of the gas and electrical industries playing into each other's hands in such a cordial manner, so that each paper supplemented the other and enhanced the combined effect.

Thirdly, we must record the general admiration excited by Councillor R. H. Minshall's able paper on the administration of public lighting, excellent in substance and mode of expression and admirably delivered. delivered. The paper doubtless represented an effort to state ideals—but surely ideals which the Association should strive for, even if it confesses their imperfect realization at present. On two main points we do not think there can be serious disagreement: the desirability of an independent and fully qualified public lighting engineer in all important cities, and the necessity for rejecting such economies in public lighting as are prejudicial to the public welfare and safety.

It was a little unfortunate that, whilst all those present evidently appreciated the lofty spirit under-

lying the paper, some speakers wandered into an irrelevant discussion of the merits of gas and electric lighting. We confess that we wonder at the simplicity of those who seem to imagine that this question can be settled once for all by a discussion of relative costs or an array of conventional claims of advantages. Surely, if there is anything that the history of illuminating engineering has shown it is that this is a barren controversy—if only because, as Mr. Stroud remarked, a decision depends so greatly on purely local considerations and because, as the President pointed out, a speaker cannot avoid (and need not be blamed for) a partisan view of the illuminant with which he is associated. It may also be taken as axiomatic that an argument which inherently attacks personal interests is bound to cause bitterness. Members of the Association and delegates would therefore do well to put aside trade rivalries and concentrate their joint efforts on bringing about a better public appreciation of the benefits of good lighting. Surely, in the case of street lighting, where desire so far outruns performance, there is ample field for such efforts!

Lastly, we would like to remind members of the invitation conveyed by the President to come forward with offers of papers for the next Conference, and to present the manuscript in ample time for it to be studied, printed and circulated. It is surely apathetic of members to leave the collection of papers to the efforts of the President and Hon. Secretary—even if, as on this occasion, their efforts led to a happy issue. We may also remind our members of the point emphasized by Councillor Fasham and clearly illustrated in the accounts for the past year—the singularly economical way in which the affairs of the Association are at present conducted. Such results are not shown without devotion and self-sacrifice somewhere, but even so the growth of the Association must inevitably entail

increased expenditure.

Therefore (and this suggestion is addressed to both members and delegates), efforts are still needed to place the affairs of the Association on a firmer basis. The readiest way of doing so, and at the same time extending the influence of the Association, is to secure new members. There are many important towns and cities whose public lighting superintendents are not yet members of the Association. If all who attended the Conference at Blackpool would endeavour to interest only one friend in the good work a substantial increase in membership would soon be secured.

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# Illuminating Engineering Society

(Founded in London, 1909; Incorporated 1930)

PROVISIONAL PROGRAMME OF MEETINGS FOR Session 1932-33.

We reproduce below the Provisional Programme of Meetings of the Illuminating Engineering Society for the coming session, which promises to be an extremely interesting one. Particulars of occasional visits, as well as the ordinary monthly meetings, are included in the pro-Particulars meetings, are included in the pro-We understand that meetings will also be arranged in various provincial cities, where preparations for the formation of local centres are being made.

1932. Oct. 11th.

The Opening Meeting, when the Presidential Address will be delivered by Lt.-Com. HAYDN T. HARRISON, the Report of Progress will be presented, and various Exhibits illustrating Progress in Illumination will be on view. Report of Progress, Exhibits, etc. (To be held at the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London, W.C.)

A Visit to the Shakespeare Memorial Theatre, Stratford-on-Avon, where the lighting arrangements will be demonstrated by Mr. HAROLD RIDGE.

Oct. 18th.

Nov. 8th.

A Paper will be read by Mr. CLIFFORD C. PATERSON, O.B.E., M.Inst.C.E., on "Luminous Tube Lighting" in the course of a VISIT to the Research Laboratories of the General Electric Company Ltd., at Wembley.

Nov. 22nd

A Visit to the Building Centre Ltd. (158, New Bond Street, London, W.1), where a special Exhibit of Lamps and Lighting Equipment may be seen, will take place at 6 p.m.

Dec. 13th.

A JOINT MEETING with the Society of Glass Technology will be held at the Caxton Hall (Victoria Street, London, S.W.), when several contributions dealing with the properties of Diffusing (Opal) Glassware will be presented.

1933.

Jan. 10th. An Address by Mr. C. A. MASTERMAN, reviewing

Recent Researches in Gas Lighting, will be
delivered in the course of a Visit to the
Laboratories and Workshops of the Gas Light
and Coke Company at WATSON HOUSE (Nine
Elms Lane, London, S.W.).

Feb. 7th. The Annual Dinner will take place at the
Trocadero Restaurant, Piccadilly, London, W.
(7 for 7-20 pm.)

(7 for 7-30 p.m.).
Paper on "Exhibition Lighting" will be Feb. 14th. A

Mar. 14th. An Address will be delivered by Dr.-Ing. N. A. HALBERTSMA (Holland), dealing with Progress in Illuminating Engineering Abroad.

April 11th. A Discussion on the Lighting of Hospitals will be opened by an introductory paper by Mr. F. C. RAPHAGL.

F. C. RAPHAEL.
The Annual General Meeting will take place and will be followed by a Discussion on the Applications of Photo-Electric Gells in Photometry which will be opened by Dr. John W. T. Walsh. May 9th.

Unless otherwise announced, meetings will be held at 7 p.m., and will be preceded by light refreshments at 6-30 p.m.

The attention of members is specially drawn to the Opening Meeting on October 11th, and to the visit to the Shakespeare Memorial Theatre, Stratford-on-Avon, on October 18th, details of which have already been circulated. Members desiring to take part in the latter event are desired to inform the Hon. Secretary (from whom vouchers for special cheap tickets and the requisite badges may be obtained) by October 10th.

# Building and the Lighting Industry

At the Conference of the Association of Public Lighting Engineers in Blackpool, several speakers commented on the general disposition of local authorities to avoid expenditure, which is sometimes carried to extreme lengths. Inefficient lighting, which is dangerous to life and limb and impedes traffic, is necessarily uneconomical, and the relinquishing of much-needed improvements helps to accentuate the general industrial depression. still more striking example of extreme parsimony is afforded by the ban on building operations, which formed the subject of a memorandum recently presented by the President of the Royal Institute of British Architects. The Illuminating Engineering Society, through its representation on the Advisory Council of the Building is being brought in contact with em. The paralysis of the building Industry, this problem. industry has thrown many engaged in this trade out of employment. It has occasioned vast losses and incurred large expenditure of public money to relieve the distress of those who would otherwise have been engaged in needful and honourable work, thus destroying a great part of any advantage in the form of national economy that might be claimed. Its indirect results are almost as serious. For the number of trades dependent on building is legion. Stoppage of work not only building is legion. Stoppage of work not only brings distress to the builder, the contractor and the architect: it imperils the livelihood of those associated with firms engaged in decorating and furnishing, in laying electric wires or gas mains, and in supplying heating and lighting equipment of every description. Truly, it would seem that in these days we need a new definition of "economy," for the existing form is like to spell ruin.

# Amalgamation of the Optical and Physical Societies

At a special general meeting of the Optical Society, held at the Imperial College of Science and Technology, South Kensington, on September 22nd, 1932. the Society was formally dissolved.

This was the final step in the process of amalgamation of the Society with the Physical Society of London, which has already made the necessary changes in its constitution. The joint societies will be known as the Physical Society, and the first meeting of the new session will be held on Friday, October 7th, at 5 p.m., at the Imperial College of Science and Technology, South Kensington, when Dr. J. W. French, F.Inst.P., will lecture on "The Manufacture of Optical Glass."

For a number of years the two societies have co-operated in various ways, e.g., in connection with the very successful exhibition of apparatus held annually in Kensington, and in the recent joint discussion on "Vision." In these days of specialization, when societies are apt to multiply, it is unusual to meet an instance of combination; but it is evident that these two societies have much in common.

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# The Association of Public Lighting Engineers

(Ninth Annual Meeting and Conference held in Blackpool, Sept. 5th-8th, 1932)

(The Association is not, as a body, responsible for the opinions expressed by individual authors or speakers.)

# General Summary of Proceedings

THE ninth Annual Meeting and Conference of the Association of Public Lighting Engineers, which took place in Blackpool during September 5th-8th, was generally considered to be one of the most successful yet held. The attendance (nearly 300) was probably the greatest yet recorded, and the papers proved to be of an exceptionally varied and interesting character.

On the opening evening there was a reception at the Imperial Hydro Hotel, the headquarters of the Association, when His Worship the Mayor of Blackpool (Councillor L. Newsome, J.P.) formally declared the Exhibition open. Councillor Newsome spent a considerable time in the Exhibition, in which he showed much interest, and on the following morning gave a cordial address of welcome in the Conference hall. The new President (Mr. Harold Davies, of Chesterfield) was then formally inducted into the chair by his predecessor (Mr. R. Beveridge, of Edinburgh), whose services to the Association received grateful acknowledgment.

Mr. Harold Davies then delivered his Presidential Address, which dealt in some detail with the public lighting of Chesterfield, and Councillor R. H. Minshall followed with an excellently phrased and inspiring paper on "The Administration of Public Lighting."

Members and delegates were then entertained to luncheon by the Blackpool Corporation. After the usual loyal toasts, "The Association" was proposed by His Worship the Mayor and Mr. R. Beveridge (the immediate ex-President) responded. For the remaining toast, "The Corporation of Blackpool," Mr. Harold Davies was responsible.

In the afternoon a short address describing the exhibits was delivered by the Hon. Secretary (Mr. J. S. Dow), after which members and delegates spent the afternoon examining the Exhibition. This was by general consent one of the best shows that the Association has had. Posters announcing the Exhibition had been prepared and displayed outside the hotel and throughout the town, and there was again a good attendance on the Wednesday (September 7th), the day set apart for visits by members of the general public.

On the Wednesday morning the first item was the Annual General Meeting (an account of which will be found on p. 236), when the elections of Mr. E. M. Severn as Vice-President, and of Messrs. J. H. Clegg, E. C. Lennox, C. S. Shapley, and C. H. Woodward as Members of Council were announced, the Hon. Treasurer, Hon. Secretary and Hon. Editor being re-elected. In the course of the proceedings Councillor Osborne, Mayor of Margate, invited the Association to hold the 1933 Conference in that town, and this invitation was gratefully accepted by the President.

Two papers, illustrating the planning of gas and electric street-lighting installations to conform with the British Standard Specification, were then read by Mr. Frederick C. Smith (Gas Light & Coke Co.) and Mr. G. H. Wilson (G.E.C. Research Laboratory). Both papers entered into the question very comprehensively, and were illustrated by numerous diagrams (a feature being the use of the "isocandle" diagram, particularly clearly illustrated by



By courtesy of "The Gue Journal."
HAROLD DAVIES, M.Inst. Gas E., of Chesterfield,
President of the Association of Public Lighting Engineers
(1932-1933).

Mr. Wilson). The papers were necessarily read in abstract, but gave rise to a good discussion, and a large attendance furnished evidence of the great interest which they had excited.

The Association luncheon, which followed, was of an informal nature, the toast of "The President" being proposed by Mr. S. B. Langlands (Glasgow), and the subsequent toast of "The Guests" by Mr. J. S. Colquhoun (Sheffield), Alderman P. J. Tomlinson, Chairman of the Blackpool Gas Committee, responding.

The afternoon was devoted to the reading and discussion of the papers describing the lighting of Colchester (Mr. H. Collins), Burnley (Mr. J. Clegg), and Oldham (Mr. I. H. Massey). These three papers served a useful purpose in illustrating the conditions of lighting typical of towns of moderate size (as compared with cities having much greater financial resources).

The evenings were intentionally left free, so that visitors could have the opportunity of exploring Blackpool and its surroundings. In doing so they were aided by the courtesy of the Corporations of Blackpool and Lytham St. Annes, who kindly arranged for them to travel free on the Corporation tramways on presentation of the Conference badge. The famous promenade, fashioned of concrete, and in all about  $6\frac{1}{2}$  miles long, was much admired, and the Winter Gardens, the Pleasure Beach, and other places of entertainment were well patronised. The only official who failed to consider sufficiently the enjoyment of visitors was the Clerk of the Weather, who served out a series of rainy days; yet it is possible that even the bad weather was not entirely a drawback, as it led visitors to concentrate attention on the meetings and the Exhibition, excellent attendances being recorded throughout!

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# The Association of Public Lighting Engineers

# **Annual General Meeting**

THE Annual General Meeting of the Association was held in the Conference Room at the Imperial Hydro Hotel, Blackpool, on Wednesday, September 7th. The chair was taken at 10 a.m. by the PRESIDENT (Mr. Harold Davies). After the minutes of the last meeting, which had been published in the official journal and circulated, had been taken as read, the Presidential Certificate and the Badge of Office, awarded to Past Presidents on the expiration of their term of office, were handed to Mr. R. Beveridge (Edinburgh). In making the presentation Mr. Davies referred to the services rendered to the Association by Mr. Beveridge, whose term of office coincided with the holding of the meeting of the International Illumination Congress in Edinburgh. Mr. Beveridge having briefly responded, the President called upon the Hon. Editor (Mr. E. J. STEWART) to present the Annual Report and Statement of Accounts.

## THE ANNUAL REPORT.

The main features of the Annual Report, which had been circulated to all members of the Association and to delegates attending the Conference, were then dealt with by Mr. E. J. STEWART. (This report, which occupies 87 pages, comprises four main sections: (a) the general survey of progress, events during the past year, and relations with other bodies; (b) a series of reports by members recording developments in public lighting in their respective localities; (c) the official List of Members and (d) the balance sheet for the past year.) He thought that they had been able to present a useful survey of progress, though the reports of a few members had arrived too late for incorporation in the general account. In future, efforts should be made to initiate the collection of data earlier in the year, and he wished to impress on all members the desirability of beginning this work as soon as possible and communicating their data to the Hon. Editor in good time before the publication of the report.

Mr. H. C. Brown (Hon. Treasurer) referred briefly to the balance sheet, which revealed a material improvement in the financial position. He was glad to be able to report that membership was steadily increasing. (Applause.)

Mr. W. J. JEFFREY (London), who moved the adoption of the Annual Report and Accounts for the past year, noted with pleasure the progress that was being made, though it was evident that the Association had still to scrutinize its expenditure somewhat carefully. There were many towns and cities not yet represented, and efforts should be made to widen the membership of the Under present circumstances the Hon. Secretary had a difficult task, and he wished to propose a cordial vote of thanks to him and Mr. Stewart and the others officers and the Council for their efforts on behalf of the Association.

The resolution was seconded by Mr. A. FORBES (Aberdeen), and on being put to the meeting was declared carried unanimously. The next item on the programme was a resolution that the existing auditors (Messrs. Cole, Bond & Co.) be re-elected for the coming year. This resolution, on being proposed by Mr. S. B. LANGLANDS and seconded by Mr. J. F. COLQUHOUN, was carried unanimously. carried unanimously.

# ELECTION OF OFFICERS AND COUNCIL.

The next business before the meeting was the election of officers and Council for the coming year. PRESIDENT reported that no further nominations for the positions of Vice-President, Hon. Secretary, Hon. Treasurer and Hon. Editor had been received. Mr. E. M. Severn was accordingly elected a Vice-President, and Mr. J. S. Dow, Mr. H. C. Brown and Mr. E. J. Stewart were re-elected to the other positions mentioned. Mr. H. V. EMPTAGE and Mr. F. X. ALGAR, who had

been appointed to act as scrutineers, then presented

their report on the ballot for vacancies on the Council, and it was announced that Mr. J. H. Clegg, Mr. E. C. Lennox, Mr. C. S. Shapley and Mr. C. H. Woodward had been elected.

A vote of thanks to the scrutineers, proposed by Capt. W. J. LIBERTY and seconded by Mr. C. I. WIN-STONE, was duly carried.

In some ensuing discussion on general procedure it was suggested that copies of papers should, if possible, be in the hands of members earlier, and that ladies should be officially invited to attend. It was also suggested that the Association should make a practice of obtaining one paper dealing with the lighting of the town or city visited.

# LADIES TO ATTEND CONFERENCES.

Mr. J. S. Dow explained that the authors of some of the papers, which were very lengthy and involved careful printing, had only been able to complete them quite a short time before the Conference. It had, in fact, been something of a feat to get them printed and delivered before the Conference opened. quite recently that members and delegates had made a practice of bringing their womenfolk, and there was as yet no definite understanding. Perhaps this occasion could be utilized to make the position quite clear.

The PRESIDENT confirmed what Mr. Dow had said in regard to papers. The Council had had to make special efforts in order to obtain papers for the Con-Their thanks were due to those members who had generously responded to their demand—in some cases made at somewhat short notice. He thought, however, that the Council ought not to have to search for papers in this way, and he urged members to come forward and offer contributions in good time, so that the papers might be available not days but weeks-and preferably months—before the Conference opened.

It was evident that there was a general feeling that ladies should be officially invited to take part in future In order to arrive at a clear understand-Conferences. ing, he proposed to put the matter to the meeting.

A resolution to the effect that ladies should in future be invited to take part in Conferences was accordingly proposed, and was declared carried unanimously.

# NEXT YEAR'S MEETING.

A cordial invitation to hold the 1933 Conference of the Association in Margate was then conveyed by the MAYOR, Councillor OSBORNE, supported by Councillor E. T. FASHAM. The latter, in wishing the Association future prosperity, remarked on the very economical manner in which its affairs were at present conducted.

Both speakers referred to the importance of the work that the Association was doing, and stated that every-thing possible would be done to render a visit to Margate informative and agreeable.

The President expressed the thanks of the Association for this invitation, which was gratefully accepted.

# VOTE OF THANKS TO THE CORPORATION OF BLACKPOOL.

In conclusion, a vote of thanks to the Mayor and Councillors and the Corporation of Blackpool for the hospitality which the Association had enjoyed was proposed by the PRESIDENT, and seconded by Lt.-Commander HAYDN T. HARRISON, who remarked on the smoothness with which all the arrangements for the Conference had been conducted. This resolution was carried with acclamation.

A final vote of thanks was accorded to Mr. Harold Davies for presiding, at the termination of the Con-

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# Presidential Address\*

By HAROLD DAVIES (Chesterfield)

THEN I became a member of this Association, and later was nominated and elected to membership of its Council, I was in honour bound to assist every effort which it could put forward in support of the aims and objects for which the Association was founded.

Our Association is still young, yet each year it grows stronger, and the need for such an organization is being fully realized. It will be my duty tion is being fully realized. during the next twelve months to make its usefulness more widely felt. It is a great honour which you have done me in electing me as your President. I thank you, and will do all in my power to be worthy of your trust and confidence.

At the outset, I ask myself, "Why have you placed me in this position?" and the answer, I think, It is because I represent a very large proportion of our members mostly employed by smaller

municipalities in dual capacities. A few months ago I had the opportunity of studying a very interesting tabulation of the replies to a questionnaire sent out on behalf of this Association, and I find that out of 132 cities and towns in the United Kingdom included in the schedule, 11 employ whole-time Lighting Engineers to control and supervise public lighting, and 121 are engaged in a dual capacity, surveyors, chief constables, gas or electrical engineers, and others being linked up in the responsibility. It is not, of course, for me to say when the duties and responsibilities of the Public Lighting Engineer become of necessity a full-time position, but of this I am convinced, that some of our cities, and many of our larger towns, would achieve much better results in public lighting without additional cost by having at the head of this service a full-time technical officer, with a high standard of training and ability for his job.

I think the time will shortly come, if it has not already arrived, for this Association to consider what steps can be taken to prepare an educational scheme for the sound guidance of aspiring Public Lighting Engineers, the summit of which might well be the diploma of our Association, with entrance into the ranks of full membership.

I have been both directly and indirectly connected with public lighting for nearly forty years, and during the past twenty years the public lighting of two towns has come under my supervision for reorganization, and I propose, with your indulgence, to recount very shortly some of the activities of the Street Lighting Committee of the Borough of Chesterfield.

Prior to 1921, the area of the borough was 2,643 acres, and by an order of 1920 was extended to 8,468 acres, and has now a population of about 64,000, and it was then that the formation of a suitable Committee to deal with public lighting was a problem readily dealt with, and the solution in my opinion proved eminently successful.

Watch, Highways, Gas and Electricity Committees were asked to appoint two representatives each, and the Committee's recommendations and resolutions covering matters relative to public lighting are submitted like all other minutes, whether statutory or non-statutory Committees, to the whole Council in Committee.

Estimates of the annual expenditure are submitted in the month of January, covering the period of twelve months to the end of March in each year. Such estimates cover the cost of gas, electricity,

\*Presented at the Ninth Annual Conference of the Association of Public Lighting Engineers, held in Blackpool during September 5th-8th, 1932.

materials for maintenance, labour for maintenance, cleaning, etc., cost of additional lighting, and a sum to be spent annually in improving the existing lighting of the town. Many of you will know what generally happens to estimates, after they have left the respective committees with their blessing. The the respective committees with their blessing. experience in my town is no exception to the general rule, but a good fight has been put up against undue curtailment of expenditure upon public lighting, and gradually, but surely, it is, I think, being realized that good public lighting is an asset to the town, and that a reasonable expenditure ought to be provided for the carrying out and improvement of the service.

The renewal of out-of-date lanterns and equipment is of first importance, and should be specially provided for in the estimates by way of maintenance, and not allowed to encroach on the amount provided for improvements, and with this explanation the costing can be kept under the respective heads of the estimate.

The public lighting of Chesterfield was a subject of much controversy in the year 1882, when electric lighting was first installed, and electricity is now the medium of lighting in the central area.

Chesterfield, I believe, can claim the distinction of being the first English town to adopt electricity wholly as a means of street lighting. The streets wholly as a means of street lighting. were lit in 1882 by means of brush arc and Lane Fox incandescent lamps, the electricity being supplied by a central station using brush machines. lamps, 40 in number, were each of 2,000 candlepower, and the 320 incandescent lamps were each of 15 candle-power.

At a later date, when the above plant became obsolete, the Corporation arrived at an agreement with the local Gas Company for the public lighting

The present electric street lighting dates back to 1902, and there are now 32 street-lighting fittings in use in the principal streets of the town. Twentyeight of these are suspended from poles 22 ft. high, planted on the edge of the footways, and four are fixed 22 ft. over the centre of the roadways, suspended from span wires. Five 1,000-watt, twenty-five 500-watt, and two 300-watt lamps are in use. The total length of streets illuminated by the above is 13 miles.

The suspension lanterns are fitted with dome-type asymmetric prismatic refractors, eight lanterns are fitted with symmetric bowl refractors, six with directional bowl-type prismatic refractors, and the remainder are without refractors. These are gradually being replaced by lanterns fitted with refractors, since with refractors the illumination midway between the standards is more than doubled, with, of course, less directly underneath the lantern.

The remainder of the public lighting in the borough is by gas, and for some years prior to 1930 I had been steadily replacing old lanterns, and in that year I was able to submit to the Committee a scheme which would provide at least 50 per cent. increase in total light output at little additional cost. The gas lighting now consists of the following:

<sup>2 15-</sup>light No. 2 Mantled Inverted Lanterns.
1 9-light No. 2 Mantled Inverted Lantern.
127 6-light No. 2 Mantled Inverted Lanterns.
1 12-light Bijou Mantled Inverted Lantern.
6 4-light No. 2 Mantled 18" upright Lanterns.
907 2-light No. 2 Mantled 16" upright Lanterns.
93 4-light Bijou Mantled 18" upright Lanterns.
29 2-light Bijou Mantled 16" upright Lanterns.
7 Miscellaneous lamps for lighting Conveniences, etc.

<sup>1,173</sup> Total.

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These are arranged so that along the main roads the intensity of illumination is increased as the centre of the town is approached, 6-light inverted gas lamps being used within three-quarters of a mile outside the electrically lit area; and beyond that distance, 4-light Bijou square gas lanterns, all reducing 50 per cent. at midnight. Important road junctions have 6-light No. 2 inverted gas lamps installed, and those of lesser importance have 3-light No. 2 gas lamps, burning all night. The remainder of the thoroughfares are lit with 16-in. square gas lanterns fitted with two No. 2 mantles, burning all night.

Six-light lamps have a mounting height of 17 ft. to light-sources, and 4-light lamps 13 ft. 6 ins., 2-light lamps being generally 12 ft. Lamps 15 ft. in height and over are maintained by men using portable and adjustable trestles up to a height of 20 ft.

The small capital cost involved on this scheme was £3,122, and the Ministry of Health sanctioned borrowing powers involving the repayment of the loan in 10 years. The expenditure covered automatic clock-controlled lighting for all gas lamps, and the provision and equipment of new lamps where necessary.

The purpose of the proposal was to make better use of the money provided from the rates for the objective for which it was intended, and the readiest way of achieving this result was to transfer some of the heavy costs entailed in lighting and extinguishing. Perhaps at this juncture I might give you the items of expenditure covered by the loans:

Main Road Lighting

1.	New 6-light Inverted Suspension Lamps, and fit to existing standards or tramway poles, including		ra-	
	tions to services			£271
2.	New 4-light 18" Square Lanterns, including	fixing		
	required height on existing standards			£280
-	Automatic Clack Controllers for the above			far.

	required neight on existing standards			200
3.	Automatic Clock Controllers for the above	• •		£213
	Lighting of Other Roads			
Ι.	New 16" square Lanterns, fitted with two No.	2 man	tled	
	Burners, including fixing to existing standards			1,278
2.	Alterations to other lamps, including brackets			£125
3.	Automatic Clock Controllers for the above			£801
			£	2,977
	Equipment for maintenance and inspection			£145
		Total	£	3,122

All clocks are fitted to run sixteen days with one winding, and winding and setting is done once each fortnight.

Cleaning and maintenance is continuous, except in bad weather, and each lamp receives a visit for this purpose at least once each fortnight, except in special cases where conditions are such as to necessitate extra attention, when more frequent visits are regularly made. Supervision and inspection is given by one foreman provided with a motor-cycle, and night lighting inspection by three men provided with cycles, and are part of the staff mentioned below.

Police reports of failures in lighting are given without delay to the central and district police stations, and communicated by telephone to the central lighting office day or night, so that attention may be given the same evening. All such failures are confirmed by special postcards provided for each police station, indicating the number of the lamp, which is visible in each lantern, and from which the foreman is informed of the exact position of each lamp affected.

During the year, the police reported "out" or "defective" 1,212 lamps, i.e., an average of 3.3 lamps per day or 0.28 per cent. of the total number of lamps lit. The Lighting Department attended to the following lamps "out" or "defective."

### Main Roads.

832 Lamps, an average of 2.3 lamps per day, or 0.19% of the total number of lamps lit.

### Other Roads.

1,790 Lamps, an average of 4.9 lamps per day, or 0.42% of the total number of lamps lit.

### Analysis of Work.

Lamp Cleaning			49.2%	of total	time	worked
Clock Winding an	d Sett	ing	23.9%	99	**	.22
Service			13.3%	**	**	
Inspection			10.9%	22	**	**
Miscellaneous			2.7%	,,	**	,,

Lighting failures on gas suspension lanterns were I per cent., and 50 per cent. of these were due to bypasses and 20 per cent. to naphthalene, and these were reported immediately after lighting hours and given attention the same evening.

On square lanterns, failures were 0.5 per cent., and 50 per cent. of these were due to naphthalene and 25 per cent. to by-passes.

During the year 36 clocks out of 1,173 have had to be returned to the makers under guarantee, due to mechanical defects, 25 per cent. of which were broken main-springs and the remainder minor defects.

In connection with service, the time now spent on this has been reduced to 8.8 per cent. of the total time worked owing to the installation of naphthalene extracting plant at the gas works, and will be still further reduced.

A little difficulty has been experienced with the gas valves of automatic controllers gumming up, and in order to overcome this, a small plant has now been installed at the gas works for the extraction of gum, and the little trouble will now be eliminated.

The maintenance of the electrical installation is dealt with by the Electricity Department.

All gas lamps are maintained by employees of the Gas Department, and for most of the work a special staff of one foreman, six men and one youth are regularly employed.

The cost of all labour, material for maintenance, renewal of installation and service, new and additional lamps, etc., is all charged monthly to the Street Lighting Committee.

Each lighting unit is provided with service and maintenance record cards for the lamp and clock controller, and it is the duty of the foreman to keep the information on these cards up-to-date, and to present each day for the inspection of the management the cards of all lamps receiving attention during the previous day. This information is obtained from daily work sheets which are issued to the workmen. A daily sheet is also submitted of all defects, so that a complete record may be tabulated monthly and annually.

Any communications or reports having reference to improvements in or additions to the public lighting are first considered by the Committee, who meet monthly (except in the month of August), and where the subject requires inspection and further report this is deputed to two or more members of the Committee along with the Lighting Engineer, and recommendations made thereon to a subsequent meeting of the Committee.

The total amount allocated from rates for public lighting during the current year is £5,033, or 4.21d. in the pound on the nett assessment, and includes £250 for normal additions to the number of public lamps, and £750 for improving existing lighting in any direction which may be deemed necessary or desirable, and this is the second year only for the Committee to be allowed any sum specifically towards improvements, and the money is, as far as

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possible, being used for the much-needed improvements required in lighting certain of our main roads, which carry not only a large volume of, but heavy, traffic.

In addition, small-scale experiments are constantly being carried out with any special lighting equipment deemed worthy of investigation.

# Actual Expenditure during the Year ended 31st March, 1932.

		2.0	V ATA WI		95~.			
						£	S.	d.
Labour						 1,046	12	5
Mantles						 170	14	1
Globes						 6	16	II
Renewals						 231	5	4
Additiona	l Ligh	ting a	nd Im	proven	nents	 752	1	4
Gas						 1,321	4	5
Loan Cha	rges					 441	0	0
Electric Wages,								
lamps,	etc.					 535	0	0
						£4,504	14	6

One of the big obstacles to improved public lighting in a town like Chesterfield is the difficulty, not to mention expense, of respacing lighting units. I suppose our experience is the same as in most other towns, where road junctions have determined the position of many lighting units, and the spacings between them have been very varied. There is now a better appreciation by many municipalities of the necessity, especially along main roads, of considering the lighting of such roads as a separate unit, and leaving side-street junctions to be dealt with quite apart, and this I feel sure will be all to the good.

At this juncture it would perhaps be opportune for me to say a few words with reference to the British Standards Institution's Street Lighting Specification, which was revised and reprinted last year, and is again in the hands of the Committee for revision. Being a member of this Committee, I certainly feel some measure of responsibility for the drafting of the amended specification. The making of this publication as useful as possible in every direction of public lighting has, I can honestly say, been foremost in the minds of every member of the Committee, and I am sure it is the wish of the Committee to make the specification cover most of the possibilities of public lighting.

The purchaser of light only for street illumination needs to be assured that he is getting that light regularly and evenly over the area and during the lighting hours. The contractor who supplies the equipment needs the conditions under which his installation is to function assured of a certain standard of power and of maintenance, and last, but not least, is the authority who is called upon to purchase the installation and power, and to maintain to the specified classification. I think it will be found necessary and even desirable to start with a classification which can and must be regularly maintained.

It is not my desire to forestall in any way the work of the Committee, but I can tell you that their deliberations are creating greatly increased interest all round in public lighting matters, and I am sure will yield a satisfactory contractual basis and a good guide to the principles of the subject.

It was my intention to say a few words here about the possibilities of linking up the alphabetical classification given in the existing specification with a descriptive classification of streets, but I find this very controversial, and therefore more for general discussion, and probably you will find an opportunity later of expressing your views on the subject. Personally, I should like to see some such linking up, as a guide to what standard should, if possible, be aimed at in different types of thoroughfares, etc., and this brings me to a point which has got to be appreciated, which is that the responsibilities for

and attaching to public lighting do not lie evenly upon the shoulders of all ratepayers within the British Isles. Perhaps it is as well that they do not, still I think it is highly desirable to give every assistance and enlightenment to more backward authorities in matters of public lighting.

As I have previously submitted, the general standard of illumination in almost every field of lighting is very much higher than it was before the war, and there is surely the necessity in our streets, where the traffic conditions have been made so much more difficult, for a similar advance. Yet I doubt whether the standard is such that it bears favourable comparison with the marked strides of lighting in other directions either by gas or electricity. There are exceptions, of course, but what I would stress, particularly in these times of industrial distress, is that economy in street lighting is inadvisable if it leads to a diminution of efficiency.

It is difficult to estimate the value of good street lighting, and its cost is often looked at with varying degrees of uncertainty even of its necessity, but surely it must be admitted that such lighting has a very material influence in reducing traffic accidents, and the consequent economic loss, and there is no doubt also that loss due to burglary and theft is reduced thereby. From figures which have been reduced thereby. From figures which have been published in the U.S.A. it is estimated that the saving by really good lighting throughout the country would pay for nearly double the expenditure needed, and no doubt an equally good case could be made out for public lighting in this country. I have, during the past twelve months, been presenting the views of some of our members before the Road Transport Congress and the National Safety-First Congress, and I then urged the desirability of co-operation in obtaining detailed statistics showing the beneficial effects of good lighting.

Each town and city could do something in this direction, and the pooling of experiences would be invaluable. The benefits of public lighting are so widespread that they often pass unrecognized by the individual citizen, and authorities in these times are naturally inclined to economy and apprehensive of additions to the rates. It is therefore to the influence of enlightened public opinion that we must look to bring about the much-needed improvements.

Our Association has done much to interest public opinion, and still more to show the way to municipalities who have in many instances taken a very keen interest in the practical and scientific papers and discussions which our Association have put forth since its inception.

And now, if I may be allowed to digress for a few moments, I should like to refer to certain matters in connection with public lighting by gas, with which, as a gas engineer, I come into more intimate contact.

There is no doubt that the Gas Regulation Act of 1924 has done much to ensure more uniformity in calorific value and pressure of gas, and very few, if any, towns would fail to offer a regularity of gas supply for public lighting which, with modern equipment, would provide the necessary illumination for efficiently lighting our streets. I would, however, like to see gas lamps and burners of every design submitted to some central testing authority, where all the conditions of public lighting would be known, and where the lamps, etc., would be called upon to withstand such conditions before the pattern could be certified as efficient and suitable for the purpose for which it is designed. Gas mantles also for public lighting should, I think, have some hallmark of efficiency.

I have no doubt some of the larger authorities will not feel the need for this, but I am speaking more

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particularly of those smaller but more numerous authorities who are called upon to carry out public lighting without being in a position to carry out accurate scientific tests in situ.

I stated very early in my address that owing to my being a dual-capacity man in a smaller municipality influenced the members of this Association in asking from me this contribution, and therefore you will fully realize that the opportunities that fall to me, and to such of my colleagues who are similarly placed, are not such as to be conducive to the production of a highly technical address. Organization is, of course, something which even the smallest local authority expects in its control of public lighting, but technical equipment and staff, whilst being necessities, are more often than not considered luxuries which cannot be afforded. Such being the case, we have to rely upon outside sources for information of a technical character, tests of lighting equipment, and the like, and I now wish to express my appreciation of the personal assistance

which has at all times been fully given both by my colleagues in this Association and my profession, and also by manufacturers of equipment.

I should like to express our very great appreciation to those technical bodies who have supported and assisted the work of this Association since its inception; the united efforts of everyone interested in good lighting are having their effect. The good work which is being done by the representatives of our Association, and by all bodies interested in lighting, is surely but steadily raising the standard of illumination efficiency in every direction, including public lighting, and we must say "Thank you" for the time and energy put forth.

To any members who have not as yet taken an active part in the work of our Association, let me now solicit your interest and determination to contribute something to our proceedings. You will find plenty of room, and will be heartily welcomed, and if my experience counts for anything, you will be a much better Lighting Engineer for having done so.

# The Administration of Public Lighting\*

By Councillor R. H. MINSHALL (Chairman of the Sub-Committee of Street Lighting, City of Sheffield)

T

MUCH of the work of the city councillor is in administering national laws, in seeing that the enactments of the State are efficiently and economically carried out in his own city. This applies in police matters, in public health, in education, in public assistance, etc.

But in street lighting, in England, we have a free hand. The Public Health Act of 1875 says we "may" light the streets. In Scotland, I understand the local authorities are compelled to do so.

This freedom to light or not to light does not lessen our responsibility. It increases it. We get no State guidance and we get no State financial help. The amount of money we can induce our Finance Committee to give us for this important and necessary public service is entirely governed by our own local public opinion. An educated and discriminating local public opinion is, therefore, essential if good street lighting is to be obtained and maintained.

An educated and enlightened (no pun intended) public opinion is I say essential, and, therefore, it is a fundamental duty of associations such as this to do their share in the necessary education and enlightenment. I would urge as a beginning that you offer up the Scotsman's prayer "Lord gie us a guid conceit of oursels." I am not here to advocate the wrong conceit, but a proper self-esteem, and an evalution of your proper place in municipal government. The Public Lighting Department has been far too long the "Cinderella" of the municipality. The lighting engineer is still to some benighted and befogged minds only a glorified lamplighter. The importance of his work in my opinion justifies his claim to be considered a chief official, and this should resultantly carry an adequate salary. He should be a fully qualified lighting engineer in sole control of his department under his committee, but not subordinate to any other department or committee. The work of a Public Lighting Department must necessarily be associated frequently with the cleansing, highways, estates, police, fire brigade, and the Public Lighting Engineer should co-operate with all these but not in a subordinate manner.

II.

How should a Lighting Committee be constituted? Should it be a sub-committee of another standing committee, and if so, of which? Should it be a standing committee itself? Which committees are specially interested in public lighting?

are specially interested in public lighting?

(a) The Finance Committee, as it must find the money to do something for which there is no legal obligation (I leave you to consider how much they are likely to find when there is no compulsion).

(b) The Gas Committee, as they wish to supply the illuminant.

(c) The Electric Supply Committee, for the same reason.

(d) The Highways Committee. Road making and road lighting have a good deal in common. The importance of the reflecting qualities of road surfaces for good visibility in artificially lighted streets is becoming increasingly recognised. Then, of course, the Highways Committee are interested because of the disturbances of roadways and footpaths in the erection or rearrangement of street lamps and in the laying of pipes and cables to feed them.

(c) The Watch Committee is certainly interested, as it is recognised that good street lighting is of great service to the police in the control of traffic, and in the prevention of crime. It has been said that one street lamp is worth five policemen.

(f) The Housing or Estates Committee because they wish their new housing schemes adequately lighted. In some cities the Housing Committee must pay for the initial cost of the street lighting installation.

(g) The Transport Committee, because well-lighted tram and bus routes are necessary for safety. In many places, tram poles are used as lighting poles.

(h) The Public Health Committee is particularly interested in the lighting of courts and such like places.

I am myself distinctly of opinion that the work of the Public Lighting Engineer should be under a separate committee. The Public Lighting Engineer should be in an independent position, and under no

<sup>\*</sup> Paper presented at the Ninth Annual Conference of the Association of Public Lighting Engineers, held in Blackpool during September 5th-8th, 1932.

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circumstances associated with the Gas or Electricity Department. (No! Mr. Chairman, I am not going to be lured into the vexed question of gas versus electricity). It is a regrettable factor when a Public Lighting Engineer can be justifiably or unjustifiably designated a "Gas Man" or an "Electricity Man." The ideal Public Lighting Engineer should be one who is willing to advise his committee, and also equally willing to carry out the illumination by gas or electricity as agreed upon by his committee.

I am indebted to our friend Captain Liberty for an interesting and amusing list of officials who are entrusted with public lighting. They include the City Engineer, the Borough Surveyor, the Electrical Engineer and Manager, the Gas Engineer and Manager, and in reply to a questionnaire sent out only last year, Captain Liberty obtained an amazing list of persons "officiating"—I assume in their spare moments—as Public Lighting Engineers. Here are a few, Chief Constable, Fire Master, Inspector of Cleansing, Gas Meter Inspector, Gas Examiner, Mains Superintendent, Inspector of Subways, Market Superintendeut, Inspector of Overhead Wires, and as a fitting climax a Foreman Scavenger.

I do not wish unduly to labour the point, but with such facts before us I feel that it is the duty of the Association of Public Lighting Engineers to emphasise the need of the appointment of a fully qualified lighting engineer in all towns and cities, and I am pleased to have this opportunity of adding

my word in support.

I may be challenged by captious critics on this bint. The blind devotees of a narrow visioned nay purblind-economy may urge that it is an unnecessary expense, simply an excuse to find another job, and so increase the cost of municipal government in the town or city, and that the work can be done adequately and efficiently by the staffs of the Gas Department, the Electrical Supply Department, the City or Borough Engineer. I am certain that it is advisable to have an expert Public Lighting Engineer, and I am certain it is economically advantageous. May I quote a few figures from my own city Sheffield. The cost per candle has been reduced since the appointment of a Public Lighting Engineer from 2s. to  $6\frac{1}{2}$ d. The burning hours increased from 3,509 per annum to 3,720 per annum. The candle-power per head of the population has been increased from 0.05 to 1.60 while the cost per increased from 0.95 to 4.60, while the cost per head has only been increased from 22.94d. per annum to 29.31d. per annum, an increase of 348 per cent. in candle power and 28 per cent. in cost. During that period, the entire lighting plant of the city has been overhauled, and amongst other improvements, over 13,000 clock controllers for gas lamps and electric time switches for electric lamps have been installed. All this expenditure has been covered by our Revenue Account.

Some industrious investigator may discover that in 1922-23 Sheffield spent £54,000 on street lighting, whereas in 1930-31 we spent £63,000, and the investigator may ask "Does the city get value for that increased expenditure?" I remind him of the above facts and figures, and add that in 1923-24 there were 11,324 gas and electric lamps in use with a total candle-power of 500,000 whereas in 1931-2 there were 20,192 gas and electric lamps with a total candle-power of 2,352,000.

Surely these figures must convince all unprejudiced persons!

### III.

Even with the greatest economy I fear the amount spent on street lighting must increase. Higher and ever higher standards of illumination are being and

will continue to be called for. The increase in the volume and speed of traffic, and the interest now shown in the Safety First Movement will demand it. There is a growing recognition on the part of the public that good street lighting means increased safety, increased comfort, and that it is a powerful deterrent to certain forms of crime.

On financial grounds alone, I feel that greater attention should be paid to street lighting by the city councillors throughout the country. No less a sum than £1,000,000 per annum is spent on this service by eleven provincial cities. We shall be met, of course, with the cry of economy. Personally I am getting a little sick of it. I was challenged recently as to the amount we spend annually on education in Sheffield. "Can we afford to spend it?" queried my challenger. My reply was that we cannot afford not to spend it. So I would say about public lighting. Let us beware lest our craze for economy leads to parsimony. It is an old truism that wise expenditure is the truest economy. Let us realise that an increase in total expenditure is inevitable in these days of increased road traffic—increased in volume and enormously in speed.

### IV.

As there is no Government grant and no local standard to which one must conform, it is extremely difficult to make comparisons between one city and another in the cost, quality and quantity of their street lighting.

The lighting rate is no guide, as the rateable values on which rates are based differ so much.

The amount per head of population is perhaps better, but obviously one cannot compare the amount per head in, say, the city of London with any provincial city.

The cost per candle is not an infallible guide as I believe there is no generally accepted method of assessing the total candle-power of any city's lighting system, and comparing one city with another.

Cost per mile of roadway does not help us, as the proportion of main street to side or residential street differs from town to town.

Each local authority is, therefore, more dependent on its own experience in street lighting than it is in any of the other essential services.

All lighting improvements in Sheffield have been financed out of revenue account, that is out of the current rates. I understand that in some parts of the world loans are obtained for this purpose. How the money is obtained is more properly a question for the Finance Committee, but I should imagine that if the usual period of repayment of 30 to 40 years is adhered to, the street lighting plant, or at least parts of it, will be badly out of date long before the loan is paid off. The system savours too much of the hire-purchase system to be commendable to me. After all, lighting improvements and developments are constant. That has been our experience in Sheffield during the past eight years.

As a strong advocate of and a firm believer in municipal enterprise, I hope that in this country we shall not attempt to rely upon private sources for defraying the cost of public lighting. The experience given us fom the United States of America does not encourage me to support private enterprise in this essential public service. Let us frankly face our moral responsibility—I regret it is not a legal responsibility—to light our roads, lanes and courts adequately. The cost is not excessive. In this, as in most cases, you get better value for money paid in rates than in any other expenditure. Taking five Midland towns with populations ranging from 230,000 up to 520,000, I find that the cost varies from 7s. od. to 2s. 6d. per head per annum, averaging

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4s. od. per head of the population. This cannot be considered excessive expenditure for the benefits conferred.

### V.

There are a bewildering number of considerations to take into account when one is deciding on the lighting of a new area or the improvement of an area or street already adequately lighted. For example:—

(a) The present standard of illumination if the street is already lighted.

(b) The standard of illumination to which it must be brought to give satisfaction, that is the class in the British Standard Specification into which the lighting should fall.

(c) The costs of the various schemes.

(d) Should provision be made for future increase in illumination, merely by the substitution of units of high candle-power, and without other additional capital expenditure?

(e) The effect on adjacent streets or areas to be lighted, already lighted or to be re-lighted.

If the committee responsible is to base its decision on knowledge, and not do its work in an off-hand and haphazard way, it is clear that this committee must have the assistance of a fully qualified lighting engineer to furnish it with all the relevant facts and figures on which it can form an opinion. It is equally clear that if these facts and figures are to be dependable, the official must be provided with the necessary testing and measuring plant, that is, the Lighting Department must have an adequately equipped photometric laboratory.

The Lighting Committee has not finished its work nor discharged its responsibility when it has authorised a new lighting scheme or an improved lighting scheme. It is responsible to the City Council for the continued good lighting of the city

streets, lanes, courts, etc.

The Lighting Department for which the committee is responsible must, therefore, be adequately staffed.

### VI

And now we must consider the status of the Lighting Department, in which is included the status of its chief officer, the Public Lighting Engineer.

I would like to say a word on the extension of the duties and responsibility of the Public Lighting Engineer. In most cities and boroughs, he is appointed as Public Lighting Engineer, having responsibility and control only as regards the lighting of streets, courts, squares, etc. I would urge that he should be the lighting engineer for the city or borough, and that his sphere of usefulness be extended by including the lighting of schools, libraries, museums, police courts, in fact all public institutions.

I have said that the Lighting Department should be provided with an adequately equipped photometric laboratory which would allow accurate measurements of the consumption of electricity or of gas lighting units, accurate measurements of the distribution of light, on the absorption of light by the different kinds of glassware, and all other matters appertaining to the science and art of illumination. Now it seems a pity that all this data and equipment by which the data is obtained should not be used to the advantage of other parts of the Corporation's work.

The logic and advantage appear so obvious that it is surely only necessary to mention the fact to secure support. To have an expert in lighting and restrict his sphere of usefulness to outside lighting only is surely an example of Bumbledom in excelsis.

The extension of the duties of the Public Lighting Engineer should necessarily result in the improvement of the status of the position. I am afraid that in one city of which I can speak with definite knowledge, but wild horses would not drag its name from me, the advice and assistance of the Lighting Engineer have been given in many cases outside his official duties. This advice and assistance have been very much appreciated, I am well aware, but I fear the improvement of the status and increase of salary have not followed, as reason, logic and ethics would seem to demand.

It may be said by my critic that having obtained a lighting expert I am looking out for work for him to do, and he may ask "Have complaints been made as to the lighting of schools, museums, libraries, etc.?" The answer is yes, and the voluntary aid of the Public Lighting Engineer has been sought and greatly appreciated. But surely, says the quidnunc, the Gas and Electricity Departments can do the work, surely the Librarian ought to know what he wants in his libraries, the Curator in his museums and art galleries, and the Director of Education in his schools. I admit they may know what they want, but I submit they do not know the best, the most effective and the most economical way in which they can obtain what they desire, and it is just here that the aid of the lighting expert should be sought. If I am ill I know what I want—viz., to get well, but I go to the scientific expert—the medical specialist—to advise how to attain my desire. If I am stupidly old-fashioned, I may unwisely run risks with unskilled, untrained charlatans.

### VI

I have little time to deal with my final point, and that is how far should public lighting be a national and how far a parochial question. That is a question that should be tackled and answered as soon as practicable.

The problems involved in the adequate lighting of arterial roads and rural thoroughfares bristle with difficulties. The enormous growth of road transport obviously forces this question to the front. I trust we are all agreed that the problem must be handled boldly—tinkering would be worse than useless. Inadequate and unscientific half-measures may do more harm than good. I know many motorists who say "Do the job well or, for heaven's sake, leave it alone."

Personally I feel that it must be treated nationally, and State aid granted with the natural corollary that the Government through the Ministry of Transport should be called in, and have a share in the settlement. Concerted action by towns, cities, and County Councils may do something, but I am becoming convinced that ultimately public lighting will require some kind of national control. Here, therefore, we are at once up against the danger of destroying local autonomy. As a beginning, I give my whole-hearted support to the suggestion that an advisory council should be appointed to explore the whole question. On such a council your Association should be represented.

In conclusion, may I appeal to all concerned in providing light to "them that sit (and travel) in darkness"—to Public Lighting Engineers and members of Municipal Corporations alike—to realize the importance and the dignity of their work, to recall the sad Prophet of old (and profit by the implied moral) who, weary of life, speaks of going to "The Land of Darkness and the Shadow of Death. A Land of Darkness as darkness itself, and of the Shadow of Death where the Light is as Darkness."

Let us all remember, as James Russell Lowell tells us, "That Light is the symbol of Truth," and do

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all that in us lies, not to come under the condemnation of St. John, that "Light is come into the World, and men love darkness rather than light because their deeds are evil."

# DISCUSSION

Mr. S. B. LANGLANDS (Glasgow) congratulated the author on his paper, which was a literary treat. It was a great help and an inspiration to a public lighting engineer to have the support of a Chairman who was so well informed on public lighting, who knew exactly what was needed, and how to get it. There was one department interested in public lighting which, he believed, had not been mentioned—the cleansing department, which could do its work much more efficiently when the lighting was good.

Alderman Bratherton (Salford) also complimented Councillor Minshall on his paper. He thought, however, that the question of economy had to be faced, and that wasteful expenditure was involved in the overlapping of the use of gas and electricity. He wished that experts could come to a decision which system was

Mr. C. S. SHAPLEY (Leeds) said that he had come in contact with many lighting systems. Although he was himself a gas man, he nevertheless used a good deal of electricity, both for public lighting and in the works. In cases where both gas and electric lighting were installed in a city and were doing good service, it would be a waste of money to scrap either system. Both gas and electricity were useful in their respective fields; no public lighting engineer and no special committee could ensure a definite decision in favour of either system. The Association was doing useful work, but improvement in public lighting was still greatly needed. Such men as Councillor Minshall did much to assist progress; on one point, however, he was not in complete accord, he did not favour Government interference.

Mr. J. B. BALMFORTH (Bingley) agreed that Government interference was undesirable, but local authorities might nevertheless receive financial aid—for example, part of the money collected from motorists might be applied to the cost of better lighting.

Lieut.-Commander HAYDN T. HARRISON expressed his appreciation of the paper. Economy in public lighting, which was a public necessity and safeguard, was a danger. If economies were necessary they should be applied to luxuries, not to street lighting, where expenditure was far below what was needed. Public lighting engineers did their best, but were involved in great difficulty when the cost per head of population was so low. The aim of the Association should be to bring public lighting up to the requisite standard, irrespective of whether gas or electricity was used. It was rarely that councils had the position put before them so clearly as in Councillor Minshall's lucid and logical paper.

Alderman L. HILL (Leicester) appreciated the importance of the paper. He had had 27 years of experience with his Council in Leicester, and had seen many progressive ideas developed. The importance of public lighting, originally a "Cinderella," was now better understood. He was a firm believer in efficient supervision, such as was secured by the appointment of a public lighting engineer. Those who proposed Government aid in connection with street lighting should recognize that such assistance inevitably involved some degree of Government supervision—which few people desired

Alderman CHATFIELD (Eastbourne) remarked what an advantage it was when public lighting engineers had a Chairman, such as Councillor Minshall, fully conversant with their work. The paper was naturally an expression of ideals. He sympathized with the author's remarks on certain problems. It was difficult to administer

public lighting with gas or electricity when one was municipally controlled and the other in private hands.

Councillor T. J. PICKERING (Finsbury) remarked that specially constructed roads were of little value without adequate lighting. He thought that ultimately national control would come. It was false economy to grudge expenditure on public lighting, and motorists might well object to taxation so long as they were compelled to do their own lighting by means of headlights.

Alderman VARLEY (Chesterfield) remarked that they had both gas and electric lighting in Chesterfield. He himself thought electric lighting superior to gas—but he did not advocate the scrapping of gas lamps in his city. This would be too expensive.

Councillor T. S. WILLIAMS (Manchester) referred to experience in that city, where public lighting was handled by a special sub-committee. He believed there was room for a combination of gas and electric lighting, but there was need for expert advice in determining the choice in any special circumstances.

Mr. L. T. MINCHIN (Gas Light and Coke Company) remarked that a general discussion on gas *versus* electricity could lead to little good result. Local authorities must make their own decisions. A testing laboratory would prove expensive for the smaller undertakings. Could not such tests be undertaken by some central authority?

Councillor E. T. FASHAM (Margate) said that he came from one of the best-lighted seaside towns, where the municipality did not own either gas or electricity undertakings. Therefore, there was a fair field for rivalry. In his experience gas lighting was the cheaper.

Dr. J. S. G. THOMAS (South Metropolitan Gas Co.) doubted whether councils or committees held sufficiently clear views as to what they required in public lighting. If these requirements were clearly stated, they could be met either by electricity or gas—although, personally, he believed in the latter! (Laughter.)

The PRESIDENT, in bringing the discussion to a close, said that the paper was admittedly an expression of idealism. No doubt the smaller authorities could not afford a special public lighting engineer. It was inevitable also that engineers or members of committees should be favourably disposed to the system of lighting with which they were associated or most familiar. Each case had to be determined on its merits, and any system suitable for a particular case would yield good results.

Councillor MINSHALL, in reply, expressed his appreciation of the reception given to his paper. Yes, he was an idealist, and was proud of it. He contended that "Idealism is the only Realism." The comparative merits of gas and electricity were outside the scope of his paper; it was a question on which there would inevitably be difference in opinion. He endorsed what Lieut.-Commander Haydn T. Harrison had said in regard to injudicious economies. He himself refused to apologize for wise expenditure on such matters as health and education, and he regarded adequate public lighting as of equal importance. He agreed that small towns or boroughs might not be able to afford a special public lighting engineer nor a well-equipped laboratory. In such matters the larger boroughs might help the smaller ones. Mr. Minchin's suggestion that there should be a central expert testing department was also an admirable one. He himself objected to Government interference-but if financial assistance was sought some degree of supervision might be inevitable. Councillor Minshall concluded by exhorting those present to uphold the dignity of public lighting, and wishing long life and prosperity to the Association.

A vote of thanks to Councillor Minshall, proposed by Alderman G. CLARK, and seconded by Capt. W. J. LIBERTY, was carried with acclamation.

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# The Planning of Street-lighting Installations to conform with the British Standard Specification for Street Lighting

THE two comprehensive papers on this subject by Mr. Frederick C. Smith (The Gas Light and Coke Company) and by Mr. G. H. Wilson (Research Laboratories of the General Electric Co. Ltd.), on September 7th, dealt respectively with gas and electric lighting.

We hope to deal more fully with these two important papers in our next number. For the moment we can only give a general indication of their contents.

Mr. Smith's paper consisted of seven main sections, entitled respectively (1) A Summary, (2) The Introduction, (3) The Development of a Street-lighting Scheme, (4) Information Required by the British Standard Specification for Street Lighting, (5) The Development of Isolux Diagrams, (6) Directional Reflectors for Gas Lamps, and (7) The Use of Isocandle Diagrams. These sections occupied the first 27 pages, but were followed by four appendices occupying more than an additional 50 pages. The appendices comprised (1) A series of 25 distribution curves for gas street-lighting units, (2) a set of 13 curves relating candle-power to specified illumination under varied conditions of mounting height, etc., (3) a set of 10 tables presenting summaries of lighting schemes, determined from the preceding

appendices, and (4) some suggested British Standard Highway Installation Classes for roads of different types

Mr. G. H. Wilson's paper, whilst having an identical object, treated the problem on somewhat different lines. The paper itself consisted of three main divisions: (1) A brief summary of the essentials of the British Standard Specification for Street Lighting, (2) A Section on the Planning of an Installation [in which (i) the class of street and lighting, (ii) the method of arrangement of lighting units, (iii) the type of light distribution preferred, (iv) the choice of type of lantern (v) the selection of actual unit to fulfil required conditions of illumination, (vi) the calculation of average illumination, and (vii) isofoot-candle diagrams are in turn discussed], and (3) the appendices, comprising: The Construction of the Isocandle Diagram and Additional Calculating Diagrams. Supplementary to the latter was a double series of plates giving charts relating lumens on street to values of b/h for various types of units, and (b) a series of isocandle diagrams for asymmetric ones.

The papers gave rise to a good discussion, which will also be summarized in our next issue.

# The Public Lighting of Colchester\*

By H. COLLINS (Borough Engineer and Surveyor, Colchester)

COLCHESTER AND ITS INDUSTRIES.

COLCHESTER is a very ancient town dating back to pre-Roman days. The Romans made a very important colony and fortress of it and much of their wall still remains. The population of Colchester in 1801 was 11,520 which had grown to 43,393 in 1921 and 48,627 at the last census. The area of the borough is 11,355\frac{1}{3} acres, and length of roads 67.83 miles, of which 14.26 miles are Class 1 main roads, 5.83 miles Class 2 main roads and 47.74 miles unclassified district roads.

A very large proportion of the post-war development has been of the ribbon type which has increased the cost of lighting as well as other public services. The geographical position of Colchester is such that it forms the gateway from London, South-East of England and South Midlands to East Anglia, in consequence of which there is intensely heavy through traffic, and particularly so during the week-ends. There is also a very heavy motor-lorry traffic conveying market garden produce to London, this passing through Colchester principally during the night.

The principal industries in Colchester are engineering, building of small ships, such as stern wheelers for river work abroad, clothing factories, oil milling, canning of food, big laundries, manufacture of special fire and heat-proof light partition blocks for building purposes; rose growing is carried out on a very large scale commercially; it is also a small port available for vessels carrying up to 400/500 tons and has a permanent garrison of 4,000 to 5,000, with extensive training grounds used by large numbers of Territorials.

The unreduced rateable value is £288,889 and reduced rateable value £275,433. The product of a

Id. rate is estimated to produce the sum of £1,069, and the amount of the general rates levied for the year ended 31st March, 1932, was 13/1 in the £1. The rateable value per head of the population is £5 13s. 2d., which is well below the average for the boroughs; this low figure renders it very necessary to closely scrutinize and consider public expenditure in all ways, as is indicated by the fact that the cost of lighting in Colchester is only  $4\frac{1}{2}$ d. in the £1, as against an average of 6d. in the £1 for boroughs.

# GAS AND ELECTRICITY SUPPLY.

The electricity works are owned by the Corporation, the generating station being modern, having been completed in 1927. The Corporation have also an extended area for the supply of electricity which extends to the coast. In connection with the National Grid Scheme current will be supplied eventually in bulk from Barking or Ipswich.

The gas works are owned by a local company.

The street lighting of the borough is effected by means of 657 electric and 717 gas lamps. The electric lamps vary in capacity from 60 to 500 watts, the gas lamps are all of the same power, viz., twin bijou inverted mantles having a consumption of two cubic feet per mantle per hour. Lighting tables are prepared half-yearly; the commencement of lighting up being at sunset and for the ordinary full lighting of the borough extinguishing is commenced at 11 p.m. On the main routes through the borough a few pilot lamps are left alight until daybreak as are some at certain other special points: these amount to 59 in all, of which 45 are electric. Since the war it has been the custom to discontinue all street lighting with the exception of the pilot lamps referred to above during June and July, but this year lighting is being maintained on a few of the more important through roads, and probably in future

<sup>\*</sup> Abstract of paper presented at the Ninth Annual Conference of the Association of Public Lighting Engineers, held in Blackpool during September 5th-8th, 1932.

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years full lighting will be in force throughout the whole of the year. The lighting table hours are for ordinary lamps 1547 with  $95\frac{1}{2}$  hours extra for those lamps lighted in June and July, and for the pilot lamps  $3720\frac{3}{4}$  hours. The lighting table and the consumption of gas and electricity are agreed with the Gas Company and Electricity Department for the various sizes of lamps, and the accounts prepared accordingly.

The price for electric current is 23d. per unit and

for gas 3/11 per thousand cubic feet.

The declared calorific value of the gas is 470 B.T.U's per cubic ft. and minimum pressure two inches.

For the year ended 30th December last, the expenditure of the Lighting Department amounted to £4,676 ios. 4d., which works out at close on 2/per head of the population, the cost of electric current and gas amounted to £2,120 iis. od. or approximately 45% of the total cost; wages of foremen, fitters, cleaners, lighters, etc., amounted to £1,631 ios. od., or 35% of the total expenditure.

For the same period the cost of maintenance per electric lamp (ordinary) amounted to £3 os. 8d.,

made up as follows:-

		£	S.	d.
Fittings, materials, paint, etc.	 		5	8
Lighters, 10/4; cleaners, etc., 6/-	 		16	4
Fitters	 		2	3
Wages (painting)	 			11
Electric Current (100 watt lamps)	 ÷	1	15	6
		£3	0	8

The gas lamps during the same period cost £2 10s. od., made up as follows:—

			£2	10	0
Gas (twin bijou burners)		 • •	. 1	4	3
0 11 0/		 			11
Fitters		 		2	0
Lighters, 10/4; Cleaners	, etc., 9/2	 		19	6
Fitting, material, paint, e	etc	 		3	4
			£	s.	d.

The total candle-power amounts to 151,760, which is equivalent to 3.12 per head of the population.

### CONTROL OF PUBLIC LAMPS.

Lighting and extinguishing is, generally speaking, done by lamplighters.

The bulk of the electric street lamps have their own separate service from the mains, though there are a few sections each with its own separate pilot wire

These were formerly more in number but as mains commenced to give trouble on account of age, separate services to the lamps or sections were provided and the lamps fitted with automatic controllers. Lamps in the new area of lighting in the outer portion of the borough are always provided with controllers. The number of automatically controlled electric lamps is 269 and similarly controlled gas lamps 17. Controllers have proved very reliable in practice and a very distinct economy has been effected by their installation.

The gas lamps consist of twin bijou inverted mantles contained in 16-in. square copper lanterns; many of these lanterns are provided with polished stainless steel reflectors so as to direct the light along the length of the roadway and so utilize it in the most efficient manner. The height of the light point is 8 ft. 6 in. above the surface of the road,

but all new lamps of these types in future are to be fixed 13 ft. above ground level.

Most of the ordinary electric street lamps are fitted in ordinary well glass lanterns with porcelain enamelled cast iron reflectors carried on swannecked brackets, the height of the light point being the same as in the case of gas lamps; these heights are also to be increased to 13 ft. in due course. In the minor roads they are fitted with single 60-watt lamps, in the more important roads single 100-watt lamps are used.

At danger points where it is especially important there should be no failure of light two bulbs are provided. In the busiest thoroughfares and at certain important road junctions, lighting is done by 200, 300 and 500 watt lamps fixed in Wembley-type lanterns, the light point being 23 ft. above the surface of the road. This system of lighting is now being extended to other streets with the exception that "Bi-Multi" reflectors are going to be used in order to conserve the light and direct in the desired directions. The older type of electric lantern is being gradually replaced with the "Bi-Multi" type; where they have already been installed they have given the greatest satisfaction.

In such an old town which has grown up through the ages without any planning since Roman times, the street lines and junctions come just by chance, and it is impossible to fix a standard distance apart for street lamps. It is of course desired that there shall always be a lamp provided at each junction, but in the newer roads lamps are provided as nearly as

possible 60 yards apart.

### WORK OF THE PUBLIC LIGHTING DEPARTMENT.

The Street Lighting Department is situated at the Council's principal depot and consists of a lamp fitting shop and store, the mess room and sanitary accommodation at the depot being for general use.

The staff consists of: Foreman fitter; assistant foreman; boy, who is trained in all branches of the work; one leading cleaner; four cleaners; 12

lighters.

All lamp posts are fixed by the Department and services laid with the exception of making the actual connection to the mains, which the Electricity Department and Gas Company do with their own staff. Records are kept of the life of all the electric bulbs and gas mantles as a check of their quality, etc. The best lighted street in Colchester is the upper part of High Street. This has a length of approximately 1,800 ft. and a width varying from 40 ft. to 82 ft. 6 in. The wider portion is lighted from central standards with two cantilevers fixed across the street, each supporting a Wembley-type lantern fitted with a 300-watt lamp. The narrower portion of this street is lighted with single 300-watt Wembley lamps supported on very long cantilever arms from columns fixed in the path near the kerb.

As an experiment a few of the Wembley-type lanterns have been replaced by "Bi-Multi"

reflectors.

The height of the light point is 23 ft. above road surface in all cases. There are 15 columns in this street, seven of them carrying two lanterns, the average distance apart of the columns is therefore approximately 130 ft. These lights are extinguished at midnight and are supplied from overhead wires in two sections controlled by automatic switches.

Small warning lights are provided on the central standards to light automatically when the larger lamps are extinguished during the night. The central columns carrying these lamps were formerly part of the overhead equipment of the electric tramway, now replaced with motor buses. The columns were protected by small islands; when taken over

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by the Lighting Committee these surrounding islands were considerably enlarged so as to act as refuges for pedestrians, the work being done in white concrete, the face of the kerb being painted in white and black sections.

Mantle replacements average about 2\frac{2}{3} per nozzle, annually, and bulb replacements about one per annum. Mantle replacements are required more frequently on wall bracket lamps, which are generally situated in narrow streets: vibration due to traffic is the cause. Mantles have nearly double the ordinary life in lamps that are fitted with automatic controllers for lighting and extinguishing.

In connection with the National Scheme for Disabled Ex-Service Men the Colchester Corporation undertook that not less than 5% of their employees should be disabled ex-service men. It has only been possible to do this by using them as lighters; many being only one-armed, naturally have not quite the normal control of their torches and there is consequently greater damage to the mantles. The number of lamps dealt with per lighter averages 90, though in the closer built up areas a rate of 120 lamps per man is reached.

There are a number of private lamps which are of some benefit to public lighting, and it is the Colchester practice to light and extinguish these on the ordinary rounds without charge; all other costs including gas or electricity are borne by the owners. Some of the automatically controlled lamps have two periods of lighting up during the 24 hours to suit the requirements of workers. The controller clocks are wound and set weekly, one failure in about 1,000 operations is experienced. Lighting is provided in courts and yards containing more than eight houses, and also is maintained in private streets if the owners of the frontage pay for the cost of the installation. The bulk of the lamps are cleaned every ten days but in the main streets they are cleaned weekly. Governors were provided on the gas lamps but were so much trouble through sticking in damp weather that by agreement with the Gas Company they were removed.

White concrete kerbs are used at all bends and special places where there is probability of vehicles striking them, and for the same reason on all the latest roads that have been constructed concrete kerbs are preferred to granite, as they are much more visible at night time.

The kerb has a sufficient batter to minimize damage due to striking them, the blow being taken at or below the middle of the face of the kerb rather than at the edge: this section also is more visible than that with the vertical face.

# THE NEW BY-PASS ROAD.

No permanent traffic signal lights have been provided in Colchester, though there is in operation a temporary set where the construction trains of the new by-pass road cross one of the main roads. They are not worked automatically, but are switched on and off by the flagman on duty at the crossing; they were installed as a help in properly controlling the road and rail traffic.

This by-pass road is being built by direct labour; it is four miles in length and is estimated to cost £292,000. Some portion of the frontage will undoubtedly be developed for building purposes, but a considerable portion, on account of the nature of the country, will not be so developed, as it is unsuitable for building. The question of lighting this road is important. On account of the great cost of providing underground cables from end to end it has been decided that along the greater portion an over-

head cable, carried on galvanized steel lattice poles 120 ft. apart, shall be provided. It is intended to provide a 300-watt lamp on each alternate cable-supporting pole.

These poles are all to be situated on one side of the road about 6 ft. behind the kerb, and reflectors are to be fixed on brackets about 7 ft. long; the reflectors are to be of the "Bi-Multi" type, with a 12½° rake outward to the carriageway, so that the beams at the midspan point meet or intersect each other half-way across the road, and thence continue onward to the opposite side, thus crossing each other for the whole length of the roadway; the height of light-sources is to be 23 ft. above ground level.

The "Bi-Multi" reflector intended to be used will take lamps from 200 to 500 watts, so that if later increased lighting is desired the 300-watt lamps can be replaced with 500-watt, or alternatively reflectors can be provided on every pole carrying 200-watt lamps.

The total estimated cost for providing the immediate installation of overhead cable, underground cable in certain sections, lamps, reflectors, services, etc., is £4,111, of which £2,400 is allocated to the Electricity and £1,711 to the Highways Departments; after the installation the Lighting Department will take over the installation and be responsible for its maintenance. The lighting has been undertaken by the Electricity Department, the basis of the charge being £3 2s. 6d. per kilowatt per annum on the wattage installed, with a running charge of 1d. per unit.

The figures work out as follows:-

£312 10 o equivalent to £1.46 per unit

The construction of the by-pass road involved the building of two important bridges, one over the River Colne, the second over the London and North Eastern Railway. The lighting of the road over the bridges, and also at principal road junctions adapted for rotary traffic, will be a matter for special consideration. Illuminated direction and warning signs will be provided, and all lighting and extinguishing controlled automatically.

# YELLOW TRAFFIC LINES.

In Colchester quite a considerable use has been made of lines painted on the road surface for directing and controlling traffic. It is generally agreed locally that yellow lines are better than white for this purpose, particularly when the road surfaces are wet, as reflections caused by street and motor lights from the unpainted road surface and a white painted surface do not make a sufficient contrast; under these conditions the yellow lines show up more distinctly than the white; for the same reason brass studs are preferred to stainless steel or aluminium.

The Colchester Council does not insure lamps and fittings against damage by accident, though such cases are frequent, no doubt due to the large amount of foreign traffic through the town.

Where possible the face of each ordinary lamppost is kept at least nine inches back from the face of the kerb, but it is not always possible to do this on account of narrowness of paths, cable, mains, etc., therein.

In the great bulk of cases where damage is done to lamps the Council recover the full cost of carrying out repairs and replacements, though in a few cases where the circumstances have been exceptional they have met the persons concerned in the accident.

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# Street Lighting by Gas in Burnley\*

By J. H. CLEGG

CONTROL,

In 1925 a Street Lighting Sub-Committee was appointed by the General Purposes Committee of the Corporation. It consisted of the Chairman and Vice-Chairman of the Highways and Sewage, Electricity, Gas, and Improvement Committees, with two additional members of the Town Council. The Gas and Electrical Engineers attend the Committee as Technical Advisers and Administrators, and the Borough Treasurer as Financial Officer. The Sub-Committee is now responsible for "lighting of streets and roads, public places, and the public clocks of the borough, and for that purpose to regulate and fix the number and the situation of the public lamps, to erect or remove the same, and to determine the method of lighting to be adopted in any particular place."

### Position prior to 1925.

Prior to 1925 the street lighting of Burnley was controlled by the Gas Committee, to whom the Gas Engineer was responsible for maintaining the scheme, the institution and the provision of additional lamps in odd places which were considered inadequately lighted, or where building schemes necessitated an extension. This method occasioned friction at times when an additional lamp was demanded by electors in a certain back court, through Councillors who were seeking re-election and whose claim as to the necessity for an additional lamp was not accepted by the Gas Engineer. The interests of the Corporation from an expenditure point of view were very carefully watched.

At that time there were 3,620 gas lamps in use. With the exception of about a dozen, they were of the 2-light No. 2 inverted-mantle type in square lanterns for all-front street lighting, and were designed and manufactured in our own workshops. In comparison with many towns, Burnley was at that time extremely well-lighted, with the exception, perhaps, of the centre of the town and some of the main tram routes.

With the addition of 13 electric lamps in use, the total annual cost in 1924 was £19,078, which amounted to a rate of 10.83d. in the pound. The price charged for gas was 3s. 3d. per thousand cubic feet, and for electricity 3\frac{1}{4}d. per unit.

# ALTERATIONS SINCE 1925.

In 1924 street lighting by hand was completely abolished; 2,275 new controllers were purchased and installed, in addition to those already existing, at a cost of £4,214. This installation resulted in an annual saving in wages alone of £1,377.

The new Sub-Committee decided upon improved lighting for the main roads on which were tram routes, and that the new lamps should be suspended from the tramway standards so as to abolish as many obstructions on the footpath as possible. This work has been carried out in sections spread over the last seven years, and is now nearly completed.

The Electricity Department began to aspire to the honour of illuminating the important thoroughfares, and the Street Lighting Sub-Committee placed all

such improvements and extensions of lighting on a competitive basis.

It has always been the practice for the Gas Department to bear the whole of the capital expenditure of the public lighting installation, and charge the Committee with an annual sum per lamp, covering the cost of capital charges, maintenance, and a charge per thousand cubic feet of gas consumed, six and a half cubic feet being the quantity charged per lighting hour for a 2-light No. 2 superheater burner. The competitive tenders had to be submitted on this basis to a standard of lighting laid down by the Committee, after agreement between the Electrical Engineer and the Author.

In the first place, test lengths were given to both Departments, although the tender of the Gas Department was the lower. These stretches were thoroughly tested as regards illumination, and inspected by the members of the Committee. It was finally resolved that 1,000-candle-power lamps should be erected on the main roads, radiating from the centre. The remainder were completed with 500candle-power lamps, in all cases spaced at approximately 40 yards distance, with a mantle height of 18 ft. 6 ins. for the 1,000-candle-power lamps, and 17 ft. 6 ins. for the 500-candle-power lamps, staggered where the provision of tram columns permitted. The final result is that  $4\frac{1}{2}$  miles of this improvement is carried out by the Gas Department and  $2\frac{1}{2}$  miles by the Electricity Department. Although the photometric results between the two systems of lighting were agreed to be practically equal, the general expression of public opinion was that gas lighting was the more effective.

In all cases of main street lighting the "Rochester" lamp has been adopted. All are fitted with controllers, and in most cases with dual control, which permits of half the mantles in each lamp being extinguished when desired, and with four tappets to permit of two lightings and extinguishings during the twenty-four hours. In the later installations stainless-steel directional reflectors are used with unquestionably improved results. Six-light lamps were used for the 500-candle-power, and 12-light for the 1,000-candle-power.

As the frequent use of a tower wagon was found to be too expensive, and the small hand-wheeled tower dangerous to use in the hilly districts, the use of a raising and lowering gear was decided upon. Our experience of the use of the flexible connection and the type with a break joint at the lantern caused us to devise a type with rigid piping which would overcome these disadvantages. The winch is placed sufficiently high to prevent interference with the winding rope by mischievous youths, and is easily reached by the attendant with a short ladder. The lantern, however, is lowered sufficiently for the attendant to clean the lamp from the ground. All our suspension lamps are fixed without the use of cup-and-ball joints.

As far as possible, all lanterns were set to project about 6 ft. into the carriageway, and the width of these roads varies between 40 ft. and 60 ft., being, of course, in the category of Class A.

All these lamps are inspected nightly by an attendant who runs along the whole of the routes in a small van. In order to ensure his safety whilst

<sup>\*</sup> Abstract of paper presented at the Ninth Annual Conference of the Association of Public Lighting Engineers, held in Blackpool during September 5th-8th, 1932.

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attending to the lamps in the dusk, he is provided with a red lamp, which he shines on one side whilst he is working; on the other side he is protected by the motor-van.

# HIGH-PRESSURE GAS LIGHTING.

One portion of the tram route lighting, half-a-mile in length, is carried out by high-pressure gas lighting. Keith 1,000-candle-power lamps are used. Gas is supplied through a branch taken from the high-pressure main provided for shop-window lighting, and at a pressure of 80 ins. water column. Alternate lamps are extinguished for restricted lighting. These lamps can be lighted simultaneously and automatically by a clock-operated governor.

matically by a clock-operated governor.

In order to avoid extreme contrasts of lighting on minor bus routes which connect up the main roads and tram routes, a higher standard of lighting has been established here. To provide for a minimum of capital expenditure, 4-light superheater burners were fixed in the lanterns, which are spaced at about 35-yd. centres and staggered. The height of the lighting-source is raised to 15 ft. 6 ins. by the provision of cast-iron extension pieces. Each burner is fitted with a multi-ray reflector. In order to permit of easy cleaning of the lantern the burner is attached to the controller by a ground joint for its easy removal from the lantern with the reflector attached.

### ARTERIAL ROADS.

In common with other towns, arterial roads have been constructed during the past few years, and competitive tenders were also obtained for this lighting from the two Departments. A total length of 5\frac{1}{4} miles is lighted by gas.

The lighting is accomplished by means of 4-light "Rochester" lamps mounted at a height of 15 ft. 6 ins. above the roadway, and spaced at 80-yd. centres, all lamps being erected on one side of the road. It is hoped shortly to double the number of lamps. The average width of the road is 60 ft.

The whole of these lamps have been fitted with "Multi-ray" reflectors, which considerably increase the effective candle-power for road illumination. Such a device is particularly necessary in lighting arterial roads passing through open spaces where no advantage is obtained in reflection from adjoining buildings. It is a most difficult type of illumination, everything in the vicinity being dead-black.

# HOUSING SCHEMES.

Housing scheme lighting and the development of new estates lead also to competitive tenders being obtained. With the exception of one installation, they are all lighted by gas. The type of steel pillar adopted for arterial road lighting was specified, but with a mounting height to mantle of 12 ft. 6 ins. A spacing of about 50 yards centres is used except in the main avenues, where lighting similar to that in the arterial type of road is adopted. The shorter spacing is necessary for the small avenues having regard to the proper illumination of the cul-de-sacs, and the numerous curves and awkward corners which are met with on such estates. For the 55-yard spacing 3-light "Rochester" lamps are used, and the lamps are staggered, the widths of the main avenues being 35 ft. and the branches 25 ft.

### SPECIAL LAMPS.

At all dangerous points in the town "danger lamps" are installed. Contrary to the usual custom

they are fixed at the actual point of danger. At crossings two lamps are erected diagonally at opposite corners, and an endeavour made to place the lamp on the near side as approached from each direction on the busier road. These lanterns are painted red, and glazed with red and white devices, the columns also being painted red and white. The effect is very striking, and the sign can be seen plainly from 100 yards distance in all directions. These lamps were adopted as a standard six or seven years ago, and were favourably commented upon at the time by the Automobile Association. The lantern and frog are made in our own works, and the pillars cast locally from our own patterns.

Great difficulty was experienced in obtaining a suitable glassware such as would give the same visibility in the day-time as when illuminated. This is a very important point. Many danger signs are inconspicuous in appearance or are situated too far away from the point of danger, causing misjudgment and confusion in the mind of the driver who is a stranger to the district. These lamps are lighted

by four No. 2 mantles.

## SHOP LIGHTING.

It is our practice to let out to consumers 8-light low-pressure or 1,000-candle-power high-pressure lamps for shop-window illumination, at an inclusive price per lamp for rent of installation, maintenance, and gas consumed for the whole of the lighting period during shop hours. The number of hours provided for is 500, which permits of the use of the lamp during dark or foggy periods in the daytime, the lamps being lighted and extinguished by the consumer. Those shops whose lighting hours are longer than the majority contract for, say 600 or 700 hours; a little extra charge per block of 100 hours is made. We have 200 of these lamps in use, and although they do not improve the evenness of public lighting, they brighten up the district where they are installed and attract the public.

### PUBLIC CLOCK LIGHTING.

All the large public clocks in Burnley, four in number, are lighted by gas. They consume over 1½ million cubic feet per annum. The largest clock, surmounting the Town Hall, has four opal dials, each seven feet in diameter, which are illuminated from the interior by twelve No. 2 mantles to each face. The lighting and extinguishing of the gas is operated automatically by mechanism attached to the public clock itself.

Gas has been found to be very suitable for this

Gas has been found to be very suitable for this type of lighting, resulting in a mellow, even illumination of each dial. The warmth given off from the burning gas is sufficient to maintain the clock room in a suitable condition, preserve the mechanism of the clock, and keep the lubricating oil from stiffening in winter.

### FLOODLIGHTING.

In October last we made an experimental effort in floodlighting the Burnley Parish Church.

The building was lighted from all sides, the lower walls being illuminated by fifteen 12-light Strip lanterns, each being provided with a stainless-steel reflector. The lamps were placed on the ground, and tilted to a suitable angle. This was found more effective than by illuminating from standards. The second and third walls were illuminated by ten 8-light "Rochester" lamps with parabolic reflectors, five being placed on each side of the lower roof behind the parapet wall at the eaves. The tower, which is about 90 ft. in height from the ground level, was partially illuminated by Strip lanterns and

"Rochester" lamps, and the higher portions by eight small "Raybol" reflectors, chromium-plated, each being fitted with a "C" burner and mantle, the whole being enclosed in cases and glazed for protection from the weather.

The effect, whilst being sufficiently good to be interesting, will not of course bear comparison with the illumination of new or newly cleaned buildings, as in the smoky industrial towns of Lancashire the buildings are exceedingly black and give very little reflection. The view was very effective from a distance, particularly from a hill which circumscribes a portion of the churchyard, although not very suitable for photographing, as unfortunately some of the lamps had to be placed in such a position that the light-source was visible from this point.

In addition to the lamps above described, we carry out all the public lighting of the adjoining townships—in five parishes, with a total of 236 lamps. The method of charge is exactly the same as in the borough, except that the price charged for the gas is 2s. 4d. per thousand cubic feet based on a reducing scale of charge in relation to the increased quantity consumed. With the exception of one parish, through which a tram route runs, we have been unable to induce these Councils to improve their standard of lighting.

Two-light No. 2 mantles per lamp, with a minimum spacing of 120 yards, appears to be their best standard, and any suggestion of an increase in their lighting rate above  $2\frac{1}{2}$ d. or 3d. in the pound is unthinkable to them. It is becoming imperative that as Class "A" roads pass through these villages and connect them up to towns, they should have a considerably improved standard of lighting, particularly as their rateable value is being substantially increased by the influx of well-to-do residents whose occupation lies in the adjoining towns.

# Hours of Lighting.

Economies in street lighting are made in the summer, when all back-street lamps and one lamp in three of the remainder are left unlighted between approximately the 6th May and the 7th August. The new lamps on improved lighting, being provided with dual control, are all lighted with a reduced number of mantles to retain the evenness of illumination. Also, for a period of three weeks before the longest day and three weeks afterwards, no lamps are lighted except those on the tram or omnibus routes, footbridges, and dangerous places. For the remainder of the year full lighting until midnight only is the rule, and on the main roads after midnight reduced lighting in each lamp until dawn. The back-street lamps, and also one in three of the side-street lamps, are extinguished at midnight, but between the months of November and March they are relighted by the controllers at 5 a.m. and extinguished at dawn. All bridges, dangerous places, and danger lamps are lighted one hour per day longer than the remainder of the lamps, which on the average are lighted half an hour after sunset, and extinguished half an hour before sunrise.

# MAINTENANCE.

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The total number of men employed in the Street Lighting Department is 21 and a foreman; 17 are engaged in washing and cleaning, winding, glazing, and general repairs in situ. Two men attend to the high-pressure lamps and shop-window lamps; one man is engaged solely on lamps outside the borough. We also employ a clock maker, who maintains the whole of our clock controllers, various recording and scientific instruments, and deputises for the foreman in his absence.

Each attendant is responsible for an average number of 225 lamps. The average number of lamps cleaned daily is 35. On one day in the week each attendant is employed in winding clocks, as we have several of the old clocks which are only of the eight-day type; the later additions are of the sixteenday type. Each attendant is engaged 44 hours per week in his ordinary daily duties, in addition to which he has an inspection every evening which occupies ordinarily 3½ hours per week. During the restricted lighting in mid-summer, the surplus men are engaged in painting the lamps and columns. Other part-time men are engaged in erecting new lamps, attending to blocked services, and repairing lanterns in the workshops.

### GENERAL STATISTICS.

We have at the present time 3,104 front-street lamps within the borough, 652 back-street lamps, and 236 outside the borough, our total being 3,992.

The average number of mantles used per lamp is 3.48 per annum, the average number per nozzle being 1.45 per annum.

The number of globes used per lamp is 0.44 per annum, and the number of panes of glass of the ordinary square lantern, 0.65 per annum.

The Electricity Department provide 187 lamps, and the total cost of street lighting to the Burnley Corporation for the year ended 31st March, 1932, is £15,463, which is equivalent to a rate of 7.3od. in the pound.

The total consumption of gas for public lighting within the borough is 86,994,000 cubic feet, and the price charged is as follows:—

For the first 70-million cu. ft. consumed 1s. 9d. per thousand cu. ft.

For the next 5-million cu. ft. consumed 1s. 6d. per thousand cu. ft.

Over 75-million cu. ft.

Is. od. per thousand cu. ft.

Average inclusive charge per lamp (gas) per annum £3 14s. 11d.

### (For 475 B.T.U. gas),

The lowest price charged for electricity for street lighting is 0.95d. per unit.

### CLASSIFICATION OF LIGHTING.

Near centre of town on tra	m rout	es	Class D.
Remainder of tram routes			Class E.
Side Street Lighting general throughout the town	lly 		Class G and H.
Arterial Road Lighting			Class H.

### ACCOUNTS AND ESTIMATES.

All accounts for street lighting are rendered to the Street Lighting Sub-Committee half-yearly, and the estimates are framed as follows:—

Usually each engineer has to submit his estimates for the ensuing year's lighting in the preceding February each year, giving at the same time a revised estimate for the current year, which ends on the 31st March.

In conclusion, I have endeavoured to outline as briefly as possible the general activities in the Public Lighting Department of the Burnley Gas Undertaking on the lines requested by the President, although I may appear to have provided a lengthy contribution as my share of this series of paperettes.

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# The Street Lighting of Oldham\*

By ISAAC H. MASSEY (Superintendent of Lighting, Oldham)

EIGHT years ago the Oldham Town Council created a separate department to carry out the work of lighting the streets of the borough. This work had hitherto been undertaken by the Gas Department, but apart from the actual operating of the installation little time was devoted to public lighting, which formed one of the multifarious duties of the Distribution Superintendent. According to the standards of those days, the town was by no means badly lighted, but ultimately the powers decided that, in view of the changed conditions brought about by the increase in road transport, the work could be much better undertaken by a Department entrusted with that one aim.

At this period, March, 1924, the streets were practically all lighted by gas. Square lanterns housing two- and three-light low-pressure burners, with a larger unit here and there, were in use. A scheme of 1,500-candle-power high-pressure gas lighting for one particular main road had, however, been launched

A small 500-watt electric lighting installation had been fitted up in the centre of the town. The tramway standards formed the medium of suspension. This experiment had been a great success, and it was clear that in any future schemes electricity had justified its claim to a share of the increased lighting

The Town Council thereupon outlined a policy which it believed would be the foundation of an efficient service, and at the same time a fair and equitable arrangement which would be approved by the Corporation's supply Departments of gas and electricity; the main roads on the east side of the town were to be lighted by high-pressure gas and those on the west side by electricity.

In a broad sense this arrangement has been quite a good one. The line of demarcation set up no doubt accelerated the modernizing of our main road lighting, and reduced to a minimum the natural jealousies of the two supply Departments, and, more important still, the arrangements certainly did achieve distinction by preventing unfair and unprofitable competition, which is a problem with so many rival engineers to-day.

# CHARGES FOR GAS AND ELECTRICITY.

To justify such an arrangement, naturally, some uniformity in the scale of charges for current and gas is essential. At this period the following rates were in operation: Gas, 3s. 2d. per 1,000 cubic feet, less 10 per cent. discount; Electricity, 2d. per unit. These charges were afterwards reduced in stages to the present prices of: Gas, 2s. 10d. per 1,000 cubic feet, less 10 per cent. discount; over 65,000,000 cubic feet, 2s. per 1,000 nett. Electricity, 1½d. per unit. The greater reduction, it will be seen, has been made by the Electricity Department.

The first four years in the life of the new Department were fairly active ones. Acute trade depression in the town has on many occasions set the financial indicator at "Go Slow." Nevertheless steady progress in modernizing our lighting plant can be recorded. This progress has certainly been more rapid on the electrical side, the Electricity Committee having agreed when schemes have been drafted to defray the costs of fitting up the installation. This has been a great inducement to the Lighting Committee to carry out its plans with the least possible

\*Abstract of paper presented at the Ninth Annual Conference of the Association of Public Lighting Engineers, held in Blackpool during September 5th-8th, 1932.

delay. We have electrified 12 miles of main thoroughfares in lieu of gas, six miles of which conform to Class F, four miles to Class E, and two miles to Class D of the British Engineering Standards Association Specification for Street Lighting. The candle-power output has increased on these roads by 424,000. We have also lighted electrically three housing estates and a number of new streets. Altogether our electric lighting installation comprises nearly 1,000 lamps, with a wattage range of 100 to 1,000, equivalent to  $18\frac{1}{2}$  per cent. of total lighing units and 42 per cent. of total candle-power output of entire lighting installation.

In drafting our various schemes for main road lighting, nothing less than the 300-watt lamp per standard or its equivalent in gas had been considered adequate. The more important traffic routes and business centres are lighted by 500-watt lamps, and 1,000-watt lamps illuminate all busy crossings. The problem of mounting height and spacing ratios has been simplified by the permission of the Tramways Department to fix all our overhead equipment to their standards. The average height of the units is 20 feet; the spacing distance 120 feet. Wherever the standards are available on both sides of the road they are utilized.

The main road lighting does not include any arrangement of staggering. The units are in most cases fixed opposite to each other on both sides of the road, or all in line on one side of the road only. Some loss of uniformity in illumination between the two sides of the road is thus occasioned, and experiments with reflecting devices to adjust this balance are being made. The importance of this point was forcibly illustrated some months ago, at a point where a fatal accident occurred on one of our highways.

### CONSTANT AND ECONOMICAL SERVICE.

In designing our electric lighting installation the aim has been to ensure a constant and economical service. The lamp fittings have now been stan-Most have a symmetrical distribution, with outer shades of the clear dish type, large open Lighting depreciation is bottoms, easy to clean. low, an important consideration with a polluted atmosphere. The wiring is overhead and sections are in circuits of two, arranged where possible on both sides of the road, with voltages of 210 and 230. The average demand on each circuit is two to six kilowatts. The four circuits permit of a reduction of 75 per cent. of current after midnight and afford a lighting range on each road section of 25, 50, 75, or 100 per cent. We maintain a full 100 per cent. service all the year round (up to midnight, of Absolute minimum risk of total darkness on any road section is thus attained, as a fault is generally confined to one of the four circuits only. The alternate circuits remain lighted, and the defect does not cause any serious traffic dislocation. It is only on very rare occasions that our service is so reduced in efficiency as to warrant the calling to duty of wiremen after lighting-up time. The system has the merit of enabling us to cut down our midnight consumption of current to 25 per cent. of the full capacity of the installation very easily, and without an intolerable distance between the lighted units.

We have installed a number of electric light fittings with dome refractors of the 160° directional type, giving a more efficient distribution. Conversion sets made to incorporate these refractors in our standard fitting (at about 25 per cent. of the cost of

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a new fitting) have been introduced. In a typical case the value of illumination at the minimum test-point has increased from 0.2 to 0.7 foot-candle. Side-streets and housing estates are lighted by 100-watt lamps, all singly controlled with the exception of one scheme, where we have a separate lighting cable and a group-switching arrangement.

The operation of switching-off the lights at midnight is manual: a motor-cycle service is maintained for this purpose. The dirt problem in Oldham, as in most industrial towns, is acute. A system of washing our lamps overhead has been adopted. A tank is fixed on the tower wagon, from which a supply of water, with a little boiler composition added, is conveyed by means of a hand-pump, through a length of rubber tubing to a specially designed water-brush. We find this method much quicker than the leather, and it is a great help in maintaining a high level of efficiency in cleaning. Our electrical installation of 1,000 lamps is easily cleaned in the course of a week.

# MAINTENANCE OF GAS LAMPS.

On the gas lighting side, "Efficiency with Economy" accurately describes our activities—efficiency in the provision of high-power units on all gas-lighted main roads, the scrapping of all obsolete lanterns and the general overhaul of all gas plant, economy by cutting out all unnecessary consumption of gas after midnight. This, combined with the decrease due to our electrification schemes, has resulted in a reduced annual gas consumption of 35 million cubic feet. The midnight economies alone amount to 23 million cubic feet.

The Lighting Department has, in two instances, received valuable assistance from the Gas Department in the defraying of installation costs. The high level of these have no doubt had a retarding influence in preventing more offers of a similar nature coming forward; at the same time we have, in my opinion, one or two of the best examples of gas-lighted roads in Lancashire. Prominent among these is Huddersfield Road, where we have installed high-pressure gas system of 1,500-candle-power lamps, mounted on the tramway standards on both sides of the road. The minimum illumination is equivalent to Class C of the Street Lighting Specification.

The maintenance figure of £3 15s. 6d. per lamp compares rather unfavourably with £3 6s. 4d. per unit for low pressure of equal candle-power. Our agreed ratings with the Gas Department for the two units are, however, more favourable to the high pressure—the output per cubic foot of gas is 42.8 candles and that of low-pressure lighting 36.4 candles; the comparative running costs per hour of the two units, including maintenance, is

1,500 candle-power low-pressure unit, 1.50d, per hour, 1,500 candle-power high-pressure unit, 1.41d, per hour. The compressing costs are borne by the Gas Department.

Another well-lighted Class E road, with units of both high-and low-pressure gas, is Lees Road. The low-pressure lamps are the 10-light "Rochester" suspension type, with distant-control device. We have found this device very satisfactory. High-power, low-pressure gas systems have been adopted on several other secondary main roads, with units ranging from 6 lights to 8 lights, graded according to traffic conditions. In many cases these units are attached to large ornamental swan-neck brackets, 13 ft. 6 ins. to reflector of lamp.

# DIRECTIONAL REFLECTORS.

On several roads experiments with directional reflectors of various types, mirror and stainless steel, have been made. In every case I have fitted two feet

extension pieces to pillars, to keep the ray out of direct line of vision as far as possible. This, to my mind, is most important; an increase in the illumination at a test point followed by a corresponding decrease in visibility is of no use.

Enamelled-top reflectors in the square lanterns are being replaced by porcelain reflectors, which are easier to keep clean. The burners are all mounted well up in the lantern to give the maximum of efficiency from the reflector.

Automatic control has been adopted on 50 per cent. of the gas lighting installation. This is used for the lighting, and also the extinguishing operation at midnight. Little trouble with the mechanism of clocks has been experienced, the efficiency of performance is 99.8 per cent., and they have shown a very good return on capital outlay, in the form of gas saved. The lighting and extinguishing of remaining lamps is still performed by the lamplighter.

### PUBLIC LIGHTING AND SAFETY.

At the approaches to busy crossings, or any point considered dangerous to traffic, I have fixed illuminated danger signals of three or four different types, and also several radiant signs which take the illumination from the existing lamp overhead. These are all effective, but this branch of our activities is badly in need of some sort of national standardization. I have increased the lighting in several streets in order to encourage their more frequent use by motorists as by-pass roads. So far as finance permits, improvements are also carried out on roads leading directly into main thoroughfares so as to avoid contrasts in the lighting which result in confusion to the motorist.

It is beyond doubt that good street lighting assists in reducing the number of road accidents, although the difficulty in accurately defining its contribution is well known. I have taken a census of accidents which have taken place in Oldham during the past three years. Correlating these with the lighting, we have the following typical results:—

Lighting Class.	Length of Road	Accidents	Vehicles per hour	Traffic risks of "F" to "D"
$\mathbf{D}$	1.6 miles	63	350	28.5%
$\mathbf{F}$	· 47 miles	10	100	1 20 3/0

Assuming the number of accidents to be proportionate to the traffic risks, I should say Class D lighting figure is much the better of the two. The adoption of similar distances and equal traffic density on both roads, one might venture to suggest, would have resulted in the comparative figures reading:—

D Class Lighting .. .. .. 63 accidents.
F Class Lighting .. .. 100 accidents approx.

As an indication of our efforts to get the best results from the expenditure, the following figures will be interesting:—

				Installat	tion.	
	1	Roa milea		Rated candle- power of installation	Candle-power per lineal mile	Candle-power increase 1932
1924		11	2	988,990	8,830	)
1932		11	6	1,415,690	12,204	
Incre	2000	-	_	106 700		43%
Increa	ases	-	4	426,700	3,374	
				Expenditure	Decrease exp	enditure in 1932
1924				£29,769	1	17%
1932				£24,625	}	7 70
	Decr	ease		£5,144		

The reduced expenditure of 17 per cent. in 1932, compared with figures for year 1924, includes 9 per

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cent. saving on total expenditure, which is directly due to lower charges now in operation for current and gas, etc. The large increase in total rated candle-power output, without any increase in the estimates, has been made possible by various departmental economies, involving the elimination of all waste and the use of the full illuminating power of the installation when it is chiefly required, viz., up to midnight.

Although there has been substantial progress in our street lighting in recent years, there is still much work ahead. Unfortunately one cannot predict rapid developments in face of the financial stringency which exists to-day, and many schemes for improved lighting are unavoidably shelved.

I would apologize for my silence about Oldham's Class A lighting. It does not exist. I aim rather at a more general uniformity in the lighting of our main roads, such as come high in the classes of the Street Lighting Specification. The art of illuminating engineering should be more apparent in some of our side streets, which are apt to get neglected in our eagerness to deal with traffic problems. The twin No. 2 burner is the standard in Oldham for this work. Some sort of comprehensive zoning plan is needed for side streets quite as much as for main roads. I have in my mind the taking into account of the rateable values of a district, which perhaps has some relationship to burglary risks.

In conclusion, I would draw the delegates' attention to the several photographs of the Oldham main road lighting. I am hopeful that they will give an impression that anything I have said concerning the public lighting of Oldham is in no way exaggerated, and that we are fully entitled to rank with the best-lighted towns in the country.

# DISCUSSION

The papers by Mr. H. Collins, Mr. J. H. Clegg and Mr. I. H. Massey, summarized in the preceding pages, were discussed together.

Mr. C. I. Winstone (The Gas Light and Coke Co.), who opened the discussion, referred to the remarkable maintenance figure, 1½ mantles per annum per nozzle, given by Mr. Clegg. In his experience a figure nearer 4 was obtained, but much depended on whether lamps were cleaned weekly, whether they were hand-controlled or clock-controlled, etc. He noticed that Mr. Clegg had referred to 16-day clocks. He preferred 21-day clocks, as the spring still remained in good tension after 14 days, when the clocks received attention. There was then less likelihood of the clock becoming slow. He questioned one statement quoted by Mr. Clegg, to the effect that with a central lighting system a person on the roadway became indistinguishable in some positions. In his own experience this was not the case—either on the Victoria Embankment or in Oxford Street, both of which were lighted by centrally suspended lamps. Surely it was on the roadway, where accidents occurred, that light was mainly needed, and it was here that the central-suspension system had the advantage.

Mr. L. T. MINCHIN remarked that it was possible for "spots" to occur on a roadway if the lighting were not too good. On London streets there was a sheen which caused a constant change of background, and it was possible to have a dark channel between two lamps, in which a figure might disappear. The case mentioned, however, was surely an extreme one.

Councillor E. H. SHORROCKS (Oldham) expressed his appreciation of the three papers, which gave an excellent idea of the medium conditions characteristic of such towns as Oldham, where the lighting gave general satisfaction. He had been present at the Conference in Edinburgh last year, which had given him considerable insight into public lighting problems. Such conferences as those arranged by the Association were of great value to members of lighting committees.

Capt. W. J. Liberty recalled a statement by Mr. Massey that pedestrians should go to a particular point in order to cross the road safely. If this was so, the spacing conditions must surely be incorrect. On centrally lighted streets in the city of London (two-thirds lighted by gas and the remainder by electricity) three conditions were satisfied: (1) one could pick up a pin in the centre of the road, (2) a newspaper could be read at any point between lamps and (3) the number of a passing car could invariably be read. If such conditions were attained with central lighting (either by gas or electricity) there was surely no need for a pedestrian to select his crossing-point so carefully.

Lieut.-Commander HAYDN T. HARRISON congratulated all three authors on the information given, which was typical of conditions in 80 per cent. of public lighting in this country.

Another speaker confirmed Mr. Clegg's figure for mantle consumption: even 1.4 mantles per nozzle per annum was not exceptional.

Mr. T. WILKIE (Leicester) urged that the smaller authorities should extend their lighting during the summer time, as the diminution might be responsible for accidents. Other speakers agreed that the practice of diminishing or even completely extinguishing public lighting during certain periods (e.g., when there was a full moon) was inadvisable.

The President, in winding up the discussion, remarked that the conditions described in the papers were not intended to be ideal; but they were representative of numerous towns of moderate size, where cost was an important consideration. When corporations owned gas or electric supply undertakings the fixing of rates was complicated by special considerations (e.g., by the question whether or no they could make a profit), but when companies were supplying gas or electricity there was surely a substantial case for asking for low rates during the night hours when the demand was small. He understood that neither of the towns dealt with had adopted automatic lighting. His belief was that if automatic lighting were used it should be adopted throughout. In Chesterfield failures of lighting due to clocks were very few, and their cost was more than outweighed by the saving in wages. He very much doubted whether it was possible to fill an ordinary bijou mantle with only 2 ft. of gas, as Mr. Collins suggested; in all probability the gas company was using 2½ cubic feet, but charging for less.

Mr. H. Collins expressed a hope that the lighting hours in Colchester would be increased shortly, especially if they were able to get a lower rate, which he hoped would finally reach 1.46d, per unit. The figure of 2 cubic feet per mantle was the one agreed with the gas company.

Mr. I. H. Massey explained that the diminution in lighting during the summer did not apply to main roads.

Mr. J. H. Clegg agreed that the alleged disappearance of a person on a centrally lighted road could only occur in exceptional circumstances. In regard to mantle consumption, he believed that even lower figures than that applying in Burnley had been mentioned during the discussion.

On the motion of the President, a cordial vote of thanks was accorded to the authors of the three papers. A vote of thanks to Mr. Harold Davies for presiding terminated the proceedings.

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# The Exhibition of Public Lamps and Lighting Equipment

THE Exhibition of Public Lamps and Lighting Equipment arranged in the basement of the Imperial Hydro Hotel, Blackpool, during the period of the Conference was quite as successful as the rest of the proceedings. The fact of the Exhibition Room being in such close proximity to the Conference Hall was a great advantage. In addition, the official opening by the Mayor of Blackpool on the opening evening and the setting apart of the afternoon of Tuesday for the examination of the display both helped to secure a good attendance on the part of members and delegates. The Exhibition had been advertised locally by means of posters distributed throughout the town, and was the subject of reference in the local press, and this led to a good attendance on the Wednesday, when the Exhibition was thrown open to the public. Another good feature, introduced for the first time at this Exhibition, was the issue of a printed 24-page catalogue based on information furnished by the exhibitors.

In an address delivered on Tuesday afternoon, the Hon. Secretary (Mr. J. S. Dow) drew attention to the varied nature of the display, and gave a brief summary of some of the most interesting things on He also emphasized its importance to public lighting authorities who naturally wish to avoid waste of light arising through the use of obsolete and inefficient apparatus. Mr. Dow recalled the and inefficient apparatus. statement in Councillor Minshall's paper that more than £1,000,000 is spent annually on public lighting by 11 provincial cities. How important, in these days of economy, that this sum should be wisely administered, under the guidance of public lighting engineers familiar with all the latest developments!

Mr. Dow also referred to the valuable services of Mr. T. R. Cook, the engineer and manager of the Blackpool Gas Department, who had supervised the equipment of the Exhibition; to the aid of the Gas and Electricity Committees, who had furnished the gas and electricity required for exhibits free of charge; and to the work of Mr. E. Stroud, who had acted as secretary of the Exhibitors' Committee.

The firms exhibiting, 26 in number, were as follows: Benjamin Electric Ltd.; Britsh, Foreign and Colonial Automatic Light Controlling Co. Ltd.; Bromford Tube Co. Ltd.; Credenda Conduits Co. Ltd.; William Edgar & Sons Ltd.; Edison Swan Electric Co. Ltd.; Electric Street Lighting Apparatus Co. Ltd.; Engineering and Lighting Equipment Co. Ltd.; Falk, Stadelmann & Co. Ltd.; Foster & Pullen Ltd.; Gas Meter Co. Ltd.; General Electric Co. Ltd.; Holophane Ltd.; Horstmann Gear Co. Ltd.; Kandem Electrical Ltd.; James Keith & Blackman Co. Ltd.; C. H. Kempton & Co. Ltd.; Metropolitan Gas Meters Ltd.; W. Parkinson & Co.; Radiovisor Parent Ltd.; Revo Electric Co. Ltd.; Siemens Electric Lamps and Supplies Ltd.; William Sugg & Co. Ltd.; Tilley Lamp Co.; Venner Time Switches Ltd.; and Wardle Engineering Co. Ltd.

# ELECTRIC LIGHTING EQUIPMENT (LANTERNS, REFLECTORS, ETC.).

It will be convenient to divide the exhibits into three main groups dealing respectively with (a) electric lamps and fittings, (b) gas lamps and littings, and (c) apparatus for automatic or distant control.

Approximately half of the exhibits come within the first category, and these will now be reviewed in alphabetical order.

The display of **Benjamin Electric Ltd.**, the first on this list, was of a very varied character, no less than

20 different designs being mentioned in the catalogue. Of these the *Rodalux* (intended for lighting long, narrow areas), the *Durban Lantern* (a simple reflector with a definite cut-off, suitable for wide-



Fig. 1 .- The "Rodalux" Unit.

spacing ratios), and the *Horalux* (a skirtless reflector for use in rural districts), may be mentioned as specially applicable to the lighting of streets or extensive outdoor areas. The now familiar *Duoflux* unit furnishes combined downward and forward illumination, and is specially suitable for the simultaneous floodlighting of both vertical and horizontal areas. Other units displayed

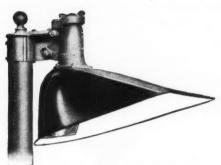


Fig. 2.- The "Duoflux" Floodlighting Unit.

included the Biflector lanterns, suitable for lighting promenades and entrances to public buildings; various elliptical-angle reflectors; and convenient projector units capable of producing a high local illumination (e.g., lighting up police officers on point duty); and such specialities as the Bakelite handlamp, popular with Government Departments and railway companies, and the Benjamin "reflector-cleaner."



Fig. 3,-The "Shadowlite" Reflector recently introduced by Benjamin Electric Ltd.

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On the stall of the **Bromford Tube Co. Ltd.** pamphlets and photographs illustrating the firms's steel poles for the support of public lamps were on view. In these days of high-speed motor traffic the importance of strength and resistance to shock of lamp columns and the avoidance of dangers arising from collapse should need no emphasis. These poles have frequently proved their power to withstand collision. The actual poles were too big to be properly shown within the Exhibition-hall (the height of which was somewhat limited), but an imposing series of columns, showing six different positions, had been specially erected outside the Imperial Hotel, and attracted much attention.

The exhibit of Credenda Conduits Ltd. included the popular Credalux Dome Refractor Lanterns. several new lighting fittings of the asymmetrical pattern shown for the first time, and various special designs supplied under contract—such as the "Glasgow" pattern lantern, of which 1,000 were supplied recently to that city, and the "Johannesburg," of which 5,000 were recently supplied in a single contract. The asymmetric units included a two-way type with separately adjustable reflectors enabling the maximum candle-power to be obtained at whatever angle the unit is adjusted to operate. Another ingenious device is an elliptical reflector which can be clipped on to the ordinary conical opentype fitting, and is thus applicable to many existing lanterns. This gives a non-axial two-way distribution with the maximum candle-powers 160° apart in plan, so that the main beams are projected on the roadway. Steel extension and pole brackets available in a wide range of standard types to harmonize with existing posts were also shown.



Fig 4. The new "Huddersfield" Two-way Asymmetrical Reflector.

The new two-way asymmetrical reflector shown in the accompanying illustration was developed in conjunction with the Huddersfield Corporation, and is fitted with two 60/150-watt lamps giving axial light distribution along the length of the street. It multiplies the candle-power of the bare lamp  $2\frac{1}{2}$  times over a wide angle, which ensures the whole of the street being covered.

A feature of the display of **The Edison Swan Electric Co. Ltd.** was a lantern of the type used for the new lighting system in Piccadilly Circus. The unit was specially designed to light large areas where a cheerful effect is required, and where it is imperative there should be an absence of glare. The unit consists of a cast-iron base, a Nelite diffusing-glass globe and a copper canopy. The new "London" lantern was also exhibited. This employs a newly designed Ediswan prismatic refractor, with a

pressed-glass outer globe, and embodies provision for exterior focusing.

Another interesting feature was the new "Vialux" directional reflector—a high-efficiency directional lantern for use in comparatively narrow roadways, on railway station platforms, etc. It consists of a vitreous-enamelled steel outer reflector of special contour, together with two inner supplementary reflectors of the same material, so placed that while they re-direct a portion of the light they also act as spill shields, and so reduce glare. The reflector is fitted with a cast-iron housing, provided with an easily detachable cap.

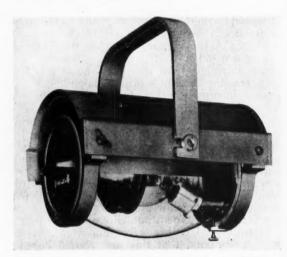


Fig. 5.—The "Toric" Projector, a new and original design.

A new and distinctly novel projector was also shown. It is known as the "Toric." It has been designed primarily to floodlight large flat surfaces, such as advertising hoardings, building façades, facia boards, etc. The special shape of the reflector results in a beam of very narrow dispersion in one plane, but of very wide dispersion in a plane at right angles. The dispersion, in other words, might be



FIG. 6.—A Cast-iron Fitting specially designed for use in the new Mersey Tunnel.

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likened to a lady's fan, and enables large areas to be lighted by a relatively small number of units. Either a 100-watt or a 250-watt projector type lamp may be used. Another special fitting which proved of great interest was the cast-iron fitting, of which over 1,500 were used, and which were specially designed for the new Mersey Tunnel. (See Fig. 6.)



Fig. 7.—The new Road Obstruction Signal, devised by Mr G. A. H. Wootton, and included in the Edison Swan Exhibit.

### A NEW ROAD OBSTRUCTION SIGNAL.

What proved to be one of the most interesting exhibits at the Exhibition was the new Road Obstruction Signal devised by Mr. G. A. H. Wootton, the Chief Engineer of Scotland Yard. The signal is capable of being operated by a single man, and utilizes three discs, one fixed and two rotatable. When in the "stop" position a horizontal red semaphore arm appears in a white background, together with the word "Stop"; for the "go" position a vertical green semaphore arm is shown on a white background, with the words "Ali Clear." At night the signal is illuminated by screened lamps placed round the periphery of the disc. The discs are operated by an electric motor, and an additional light signal (either red or green) at the top for night use is also operated by this motor gearing. The signal has other interesting features, provision being made for every contingency, and is regarded as completely "foolproof."

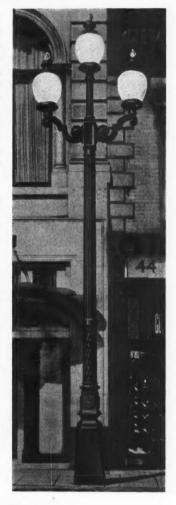
A feature of the display of the **Electric Street Lighting Apparatus Co.** was the series of "Bi-Multi" and "Multi-plane" fittings, of which many thousands are in use throughout the country. Attention is drawn to their distinctive value in increasing the illumination on sections of the road which would otherwise be comparatively dark, and to the fact that they are practically indestructible and can be easily cleaned in position without the removal of lamps.

# THE HUB OF THE EMPIRE

The latest proof of EDISWAN Lighting supremacy: Piccadilly Circus, the world-famous home of Eros, has been equipped with a new lighting installation planned by Ediswan Engineers in conjunction with The St. James' and Pali Mall Electric Light Company Limited, and employing Ediswan units on standards specially designed by Mewes and Davis—Architects.

The whole of the work has been under the direction of Mr. L. J. Veit, C.E., F.S.I., City Engineer and Surveyor to the City of Westminster.

The outer standards, 26-ft, high, each carry three lanterns, each fitted with a 1,500 watt ROYAL "EDISWAN" LAMP. The Standards which ring the centre island on which Eros stands are bronze, similar in construction though only carrying a single lantern.



# EDISWAN LIGHTING SERVICE

Ediswan Engineers are available to collaborate with Engineers. Architects and Contractors in the planning and execution of lighting schemes in any part of the country, without obligation.

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# EQUIPMENT



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The Engineering and Lighting Equipment Co. Ltd. showed street-lighting lanterns, ornamental brackets, contact gears, raising and lowering equipment, time switches, heavy-duty lampholders, and anti-vibrator attachments.

The lanterns were of the familiar "Glasgow" "Trent," "Greenock," and other types—the latter a variety that had been particularly widely used in South African cities. Besides fittings composed of diffusing glass, a new directional fitting (the "Pinnacle") was on view. This utilizes reflectors of mirrored glass, so designed that whilst the roadway is effectively illuminated, a certain amount of light strikes the surfaces of horizontal buildings, thus avoiding excessive contrast. The automatic contact gear is regarded as specially suitable for directional units, and the anti-vibrator attachment is of the familiar form (comprising concentric rings connected by strips of phosphor-bronze) used by the Admiralty to absorb vibration due to gunfire.

The exhibit of **The General Electric Co. Ltd.** included a representative selection of street-lighting equipment, amongst which may be mentioned: specially designed diffusing-glass post top lanterns on fluted-steel standards with cast-iron base; hexagonal type lanterns glazed with diffusing-glass panels and incorporating a new series of single-piece non-axial prismatic glass refractor for controlling the distribution of light; totally enclosed nonventilated types of 1,000-1,500 watt "Wembley" lanterns; examples of double-arm decorative brackets with diffusing-glass lanterns.

There was also on view a series of photographs illustrating installations of "Wembley" lanterns and "Paisley" lanterns were installed on street columns in the grounds of the hotel, adjacent to the Exhibition.

THREE DISTINCTIVE EXHIBITS.

In addition to these exhibits there were three special items of a distinctive character, illustrated in Figs. 8, 9 and 10. These devices were particularly interesting in setting a new precedent at these exhibitions.

A distinct novelty was the new G.E.C. Portable Photo-electric Photometer, wherein the photo-electric cell (which is exposed to the illumination to be tested) replaces the eye, and the human factor is thus in a large measure eliminated.



Fig. 8.-A General View of the new G.E.C. Photo-electric Photometer.

The photo-electric cell is contained in a separate unit complete with amplifying valves and rangechanging devices, all of which are embedded in

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paraffin-wax in order to secure and maintain the high insulation necessary. The metal containing box screens the amplifier from external electrical disturbances.

The measurement is made by adjusting a potentiometer until the galvanometer deflection is zero, which indicates that the valve bridge is balanced. The potentiometer reading multiplied by the calibration factor gives the value of illumination.

The "Viewscope" apparatus for studying streetlighting installations from a model will be familiar to many of our readers, but in the form shown at Blackpool there are several new features. apparatus, it may be recalled, consists of a long box with peep-holes at one end. By means of miniature lamps, arranged in different ways, it is possible to illustrate the different effects produced by alternative systems of street lighting, and to compare the appearance of any chosen street illuminated in a variety of ways. The spacing, intensity and character of the lighting system can be altered to simulate desired conditions. By means of mirrors, a gradient or curve in the roadway may be represented, and one can compare the effects of the same lighting conditions on long and short roads. Two types of road surface are available, matt and shiny. ability of any chosen scheme for lighting a given thoroughfare can be demonstrated by the use of a photograph of the street in question projected on to a view of the model.



Fig. 10.-The "Ray-Path" Apparatus.

Thirdly, we have the "Ray-Path" apparatus, a device involving the oblique illumination of a diffusing-glass plate that has been designed to determine the path of a ray of light, its deviations at reflecting or refracting surfaces, and its course within the material of the deviating medium. Cases of total internal reflection within the glass of a reflector or refractor are readily detected. Furthermore, the amount of reflection at any surface can be observed and the efficiency of the optical system estimated.



It ensures efficient light through-To you it means the out life. difference between apathy and interest. CRYSELCO is the lamp with the story. Tell that story and turn it to your own profit. Write for price list, etc.

The Lamp with Two Skins

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Fig. 9.—The "Viewscope" Apparatus for studying street-lighting installations.

Messrs. Holophane Ltd. showed a series of prismatic street-lighting refractors having various light-distributions. These refractors are divided into three main groups—bowl, dome and band—and there is also a large ornamental type. In each case the method of light control is similar, the prisms being arranged on the exterior of the inner member and the interior of the outer member. The two members are sealed and clamped together, giving the unit a smooth interior and exterior surface which is easily kept clean, the actual optical system being fully protected from the weather. (This avoids the necessity of enclosing the units in an outer globe.)

Six different types of *Bowl Refractors* are available—the symmetric, having a circular distribution and being suitable for open areas, squares, etc.; the asymmetric for positions along one side of a road where the spacing is relatively close or the road very wide; the two-way non-axial for staggered

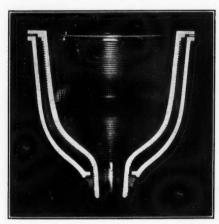


Fig. 11.--A Sectional View of Holophane Refractor, showing the combination of prismatic members with a smooth exterior.

spacing along an average road between intersections; the three-way for "T" junctions, the four-way for normal crossings, and the two-way axial for central suspension between intersections.

The dome refractors are available for symmetric, asymmetric and two-way non-axial distribution, the

# THE "MARS" FLOODLIGHT PROJECTOR



Many of the most important and best known floodlighting installations in the country employ this projector. Thousands are in use and have many years trouble-free service to their credit.

This projector's main features are its robust, weatherproof design, its highly efficient reflecting mirror of stainless steel and its positive lamp focussing device. Special accessories are available for varying light control to suit most floodlighting purposes. Ask to see a specimen projector.

Ediswan lighting engineers have specialised in floodlighting in all its forms and will be pleased to prepare schemes of every description gratis and without obligation.

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Fig. 12.—Complete Holophane Refractor Lantern.

band type being limited to the symmetric and two-way non-axial. The ornamental unit is supplied in two types for symmetric and asymmetric distribu-Two main series of lanterns, the cast-iron and spun-copper types, are available. Both are arranged with anti-vibration lampholder and external lamp-focusing device.

The exhibits of Kandem Electrical Ltd. make it evident that freedom from glare is regarded as the main object in the design of their street-lighting apparatus. The various lanterns all embodied some arrangement for shrouding the light-source from direct view, either by means of reflectors or diffusing media. This principle is illustrated in the Kandem "Mirrorlite," which also embodies the characteristics of an extensive light-distribution—so far as this can be achieved without glare. A specially shaped glass mirror reflector fitted within a metal outer cover completely surrounds the lamp. In order to obviate sharp shadow lines on the façades of adjacent buildings, usually resulting from opaque reflectors, a diffusing-glass band is fitted below the reflector which softens the shadow line by allowing for a small upward component of light above the main angle of dispersion.

One of the outstanding installations with this type of "Kandem" lantern has been made at Southend, where a number of these lanterns have been centrally suspended over the roadway, as shown in the adjacent illustration.

A lantern with similar characteristics is the Kandem "Throlite" lantern. This embodies a This embodies a detachable one-piece prismatic-glass lining fitted inside an opaque reflector. As no diffusing-glass band is fitted in this case, it is advocated that this lantern should mainly be used in industrial areas where freedom from glare is required. The lantern is specially recommended for railway stations, railway sidings, docks, etc. The adjacent illustrarailway sidings, docks, etc. The adjacent illustration of a Kandem "Throlite" installation in the London Docks shows one of these typical appli-

The Kandem "Glowband" series of lanterns represents yet another design. In this case completely open diffusing-glass bands surround the light-source, whilst vitreous enamelled inner and outer reflectors direct the main portion of the light downwards, at the same time allowing for a good upward component of light, which is directed on to the façades of adjacent buildings, and thus prevents the well-known "tunnel effect." These lanterns can be supplied with two lampholders for the use of two lamps of 60 watts up to two lamps of 500 watts per fitting, a welcome feature at the present time when economy plays such a large part in public expenditure. With suitable wiring, one lamp per fitting may be extinguished when the volume of traffic no longer requires the full degree of illumination. The illumination can thus be practically halved without sacrificing uniformity, which is the case if alternative lamps are extinguished.

A further step in the direction of good diffusion and freedom from glare has been taken by the design of the Kandem "Glowbell" series of lighting units. In this case the light-source is surrounded by a bellshaped diffusing-glass completely open below, and only inner reflectors are used. This lantern requires closer spacing than any of the designs previously described. All the foregoing "Kandem" streetlighting lanterns have focusing lampholders, which are easily adjustable from the outside of the lantern. They are available in various designs with cast-iron bodies, heavy-gauge pressed-steed bodies, and heavy-gauge spun-copper bodies.

Another notable exhibit at the "Kandem" stand was the "Dia" long-burning flame-arc lamp for street lighting, for A.C. or D.C. The main features are the long-burning period of the carbons-about



(a) "Mirrorlite" Lantern.



(c) "Glowband" Lantern.



(b) "Throlite" Lantern.



(d) "Glowbell" Lantern.

Fig. 13.-Typical "Kandem" Lanterns.

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Fig. 14. -" Throlite" Lanterns installed in the London Docks.

150 hours per trim—the high efficiency and absence of glare.

Other exhibits included: --

Kandem "Floodlights," embodying silvered glass mirrors and heat-resisting front glasses. Narrow and wide-angle types are available, types with white vitreous enamelled reflector giving wide beam dispersion. Kandem Moisture-proof Fittings for Public Baths, and Kandem "Pilolite" fittings for hospital lighting. The pilot lamp in this fitting can be used from the same source of supply as the main light (serving purely as a pilot lamp) or from a separate source of supply (then serving as an emergency light). The pilot lamp casts no objectionable shadow on the glassware of the fitting whilst the main lamp is in use.

The exhibit of **Revo Electric Ltd.** was of considerable interest. In the small space available a judicious range of suitable fittings for a large variety of purposes was displayed, together with a few drawings of standards, etc., which form an important

accessory in street lighting.

One exhibit of special interest was a one-piece "Dome" Refractor having a Fresnel lens formation incorporated in its prismatic construction. This has been patented in various forms, and is suitable for straight, curved and intersected roads. The special features claimed for this new unit are a more even distribution, a higher percentage of the luminous energy generated being directed to the road surfaces within those angles determined by the adoption of the B.E.S.A. recommended spacingheight ratios. Outside these angles the filament is cut off and the refractor intensity is so reduced that the glare question may be regarded as eliminated. The model exhibited was the first one made. Further samples are now being subjected to exhaustive tests to ascertain the degree of success that has been attained in these desirable objects.

The display also included examples of traffic

signals and warning signs.

The exhibit of **Siemens Electric Lamps and Supplies**Ltd. included the "Sheffield" street-lighting reflector which consists of a spun-steel body, vitreous enamelled, white on the under side or reflecting surface and green on top. It is fitted with a detachable canopy, which can be provided with the usual type of twin-lead-in suspension. A glass cylinder is fitted to the under side to protect the lamp from rain or other climatic conditions. The reflector is designed specially for use with the opal type of gasfilled lamp, and provides an even diffused illumina-



Fig. 15.-" Mirrorlite" Lanterns centrally suspended in Southend.

tion over a wide area. Three sizes, suitable for 200, 300 and 500 watt lamps are being shown.

In addition, a complete range of lamps suitable for all purposes, examples of the latest floodlighting equipment and a range of time switches were on view.



Fig. 16.-A new form of Dome Refractor (Revo Electric Ltd.).

The Wardle Engineering Co. Ltd. arranged a selection of pillar mounting brackets, carrying different types of street-lighting lanterns. Some familiar types ("Argyle," "Talbot," "Wallace," etc.) were shown, and there were two new designs, the "Devonian" and "Cambrian" lanterns, both combining a cast-iron canopy, a vitreous enamelled spun-steel reflector and a one-piece dome refractor. Designs of pole mounting brackets suitable for rural districts were on view, and there was a selection of switch fuse-boxes, time-switch boxes, and various street-lighting accessories.



Fig 17 .- The "Placton" Lantern (Revo Electric Ltd.).

GAS LAMPS AND LIGHTING EQUIPMENT.

There were seven exhibits that may well be included under the above heading and dealt with

alphabetically.

The representative display of William Edgar & Sons Ltd. contained various standard items (though the firm designs and makes any type of lantern to specification). Of standard types attention may be drawn to (1) The 1932 pattern 6-light "Eclipse" lamp, with upright fixing. This can be supplied in the standard size to have four, five or six mantles; larger sizes for seven, eight, nine or ten mantles are also manufactured. (2) The "Ionic" Circular Lantern, also a symmetrical type, but of rather better appearance than the ordinary square lantern. This is suitable for lighting principal streets, squares, sea-front promenades, etc. Either upright or inverted burners may be used, and the lantern can also be arranged for any system of lighting, by-pass, or torch or controller; stainless steel or other special reflectors can be supplied. (3) The "Caxton P" Lantern, fitted with hinged top, which is of the square type. It is fitted with a superheated burner of the latest type, which can be arranged to take either No. 1 or No. 2 size mantles as required. (4) A specially designed all cast bronze standard octagonal lantern, fitted with muffled obscured glass, suitable for gate piers, entrances to town halls, etc., The size shown was adapted for two or three mantles on a superheater, each mantle taking approximately 1 cubic foot per hour. (5) A specially designed all cast bronze bracket lantern, also with muffled obscured glass, and suitable for corridors, etc., of public buildings.

An outstanding feature of the display of Messrs. Falk, Stadelmann & Co. Ltd. was the series of outdoor lamps of the "Warrington" type. Besides those of the familiar inverted type with either single or cluster burners, varieties equipped with special reflectors have been evolved. Special interest attaches to the three-tier 12-section directional reflectors in stainless steel (72605) which are fitted to standard lanterns and to the "Warrington" outdoor flood lamp equipped with Striplite superheater to take 10 Bijou mantles, and with adjustable polished stainless-steel reflector at back. Another unit of somewhat unusual character is the highpower gas lamp for floodlighting the interior of showrooms, duplicate lamps with parabolic reflectors being mounted side by side.

There was also on view a complete range of "Veritas" street-lighting burners and of "Veritas" Alpha silk mantles. Of special interest was a variety of these mantles so treated as to yield a light

closely resembling ordinary daylight.

Perhaps the most interesting feature of this exhibit, however, was the display of gas signs, which have been marketed by the firm for the first time during the past few months. These signs are extremely simple in principle, they are substantially foolproof, and the cost of operating them may be regarded as negligible. There are two varieties of static sign manufactured-that with the burner above, reflecting the light downwards on to the wording of the plate glass, and that with an enclosed burner at either end of the sign, reflecting the light Each of these types is illuminated by means of two Bijou mantles, producing a very excellent effect.

The moving signs, which are specially interesting, are again divided into two main types-that with the wording to be reproduced out of a metal sheet immediately behind the front screen; and that with a plain opal screen and the wording stamped out of the revolving cylinder within.

The display of Messrs. Foster & Pullen Ltd. included: (1) Square lanterns fitted with both stainless steel reflectors and Holophane refractors; (2) an assortment of Strip Lanterns for advertising purposes, together with slatted reflectors for flood-lighting; (3) a selection of well-known "U-type" fittings; (4) a varied series of burners for public lighting.

There are also on view semi-portable units for indoor displays for showrooms and other purposes, and other standard lines of equipment with which the

firm's name is associated.

The display of Messrs. James Keith and Blackman Co. Ltd. included the following typical high-pressure gas lamps: One 1,000 candle-power suspension lamp, No. 807, "Squat" pattern, fitted with special directional reflector; one 1,500 candle-power suspension lamp, No. 805, fitted with special directional reflector; one 2-light 2,000 candle-power suspension lamp, fitted with 1932 pattern heaters (a smaller edition of the recognized centrally suspended City lamp); one 2-light 3,000 candle-power standard pattern suspension lamp, No. 920, as used in the City of London and West End. All these lamps are fitted with automatic lighters for distance control.

Raising and lowering gear and raising and lowering and traversing gear were fitted to columns carrying low - pressure gas lamps outside the

Exhibition.

Messrs. C. H. Kempton & Co.'s exhibit includes, amongst other items: (1) The "Majestic" circular lamp, central suspension with superheaters arranged for ten to twelve No. 2 mantles, approximate candle-power 1,000; (2) the "Kemborn" circular lamp, central suspension with superheater arranged for six staggered Bijou or four No. 2 cluster, giving approximate candle-power of 380 to 400; (3) highly polished stainless-steel directional reflectors for use with above units-a unit for general floodlighting purposes, with parabolic trough reflector, giving about 2,000 candle-power; (4) I-light and cluster inverted burners for indoor lighting; (5) circular and

square lanterns for street lighting.

The "Majestic" lamp (1), fitted with a 10-light superheater and the latest dual reflector, attracted much interest. It is remarked that the service illumination from these lamps, mounted 22 ft. high and 150 ft. apart on a 50-ft. road, is of the order of 0.14 foot-candles—40 per cent. in excess of the illumination for Class "E" roads in the B.S.I. Specification for Street Lighting. This is considered an excellent result. The performance of the "Kemborn" lamp (2) is also very good for such a small unit, 380 candle-power being emitted at 45° below the horizontal, with a consumption of 9.2 cubic feet per hour. The service illumination of these lamps, mounted 120 ft. apart and 15 ft. high, with a road width of 35 ft., is about 0.04 foot-candle.

The centre of attraction of this stall, however, was the new six-light floodlight. A 12-light unit is also being put upon the market. The raising and lower ing of the beam is very simply effected and the curve light-distribution is considered exceptionally good—the candle-power only diminishing by about 25 per cent. on either side of the maximum point. It is believed that these new and inexpensive units will prove of value for many different objects, e.g., not only for architectural and landscape lighting, but also for illuminating dangerous crossings and for arterial roads, docks, railway sidings and foundry

The exhibit of W. Parkinson & Co. included a variety of gas street lanterns, including square patterns with self-contained inverted burners, having outside gas and air adjustment and fitted with These designs upright swan-neck type burners.

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were shown with cluster and alignment burners. Various forms of conversion fittings were also shown.

The most important feature, however, was the "Mor-lite" directional reflector, of which two models were shown, one for square or round lanterns, the other for use with suspension or "U" fixing arc lamps. Both models are inexpensive and universally adjustable, and the wings easily detached for the purpose of cleaning, etc. The use of these reflectors materially improves the candle-power in directions where it is mainly needed, e.g., at angles of 10° and 20° below the horizontal.

Always to the fore in the movement for better street lighting by gas, and quick to exploit reflection as the source of greatly increased candle-power without additional consumption, Messrs. William Sugg & Co. Ltd. took full advantage of the opportunity to display the many fittings and devices which they have produced.

Their exhibit made it evident that, for general street-lighting purposes, Messrs. Sugg's whole-hearted recommendation goes to their famous "Rochester" lamp, in either its upright or suspension form, according to the purpose to be served. This is not surprising when one realizes the large number of important lighting contracts which have been obtained on the performance of this lamp. Thus we saw a 6-light upright "Rochester" lamp with "Multi-ray" reflector and controller in the base; an 8-light "Rochester" suspension lamp with dual supply (six and two lights) fitted with "K" type rustless-steel directional reflector, clock controller and governor; a 6-light ditto, with chromium-plated police reflector and clock controller; a 4-light ditto, with "Multi-ray" reflector; a similar lamp with four mantles in line and the "S" type directional reflector.

Other interesting exhibits for general purposes were the 3-light "Promenade" lamp, which, like the upright "Rochester," uses the bowl form of glassware, but is made on plainer and more economical lines, and the firm's well-known 18-in. "Windsor" lamp, with four No. 2 mantles—probably the most popular of the square, glazed-pane type of lamp.



Fig. 18.—Suspension "Rochester" Lamp with Multi-Ray Reflector.

Then for special purposes the flood lamp will be found of particular interest, while others in this category were the I-light "Littleton" lamp, with ruby globe for road crossings and danger spots; the 3-light "Littleton" suspension lamps with adjustable chromium-plated parabolic reflector to light important road signs; the No. 1548 back lamp for subways and other positions calling for wall-fixing; and the "Holyhead" lamp, a bracket-fixing model for porches, passage ways, etc.

A comprehensive display was made also of *Conversion sets*, the novel feature of many of them being that they include the "Multi-ray" reflector, thus permitting an old lamp to be converted from the obsolete upright or large size inverted mantle to the efficiency of the latest type new lamp with superheated small mantles and reflector.

Examples of reflectors, apart from the lamps, included a special "Multi-ray" made in stainless steel with six facets each side; a stainless-steel reflector for the 16-in. "Windsor" lamp, with special directional wings, and several forms of the rustless-steel Directional reflector.

Miscellaneous items of interest were several governors of varying types, and Sugg's Patent Distant-control Device, the working of which was made clear by means of actual sections; these section models, too, included a gland pattern control



Fig. 19.—Upright "Rochester" Lamp with Directional Reflector.



Fig. 20.—Upright "Rochester" Lamp, with wrought-iron scrolls, "Multi-Ray" Reflector and Controller base.



Fig. 21.—"Promenade" Lamp with Clock Controller.

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# REFLECTORS for PUBLIC LIGHTING

—the devices which have proved so wonderfully successful in enabling Gas Undertakings to retain and increase this important part of their business.

# Sugg's DIRECTIONAL REFLECTOR

in RUSTLESS STEEL, with single or multipletier faces, is made for all types of lamps, square or round, upright or suspension; the de-luxe reflection device.

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with its series of SILVERED GLASSES, is already widely used in square lamps, and is now available also for "ROCHESTER"—suspension or upright—lamps; easily fitted to existing lamps without dismantling. The reflector to get the results at low cost.

WRITE FOR FOLDERS giving full particulars and Polar Curves showing the wonderful increase of candle-power given by these reflectors.

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cock, which is used largely and successfully in connection with the distant-control device.

It will be gathered that the reflectors provided the principal feature of the exhibit, and they are certainly worthy of the closest study by lighting authorities who seek to provide adequate illumination at lowest possible cost; the object of these reflectors is, of course, to arrest the rays of light which would normally be wasted and re-direct them up and down the roadway where they can be of great service. There are two main types of these reflectors—the "Directional," a one-piece arrangement in rustless-steel providing multiple tiers of reflecting faces to be fixed alongside the light, and the "Multi-ray" consisting of a metal framework which carries a number of facets of silvered glass, in its normal form, although these can be of rustless steel also; this device is fitted below the light, and the facets are adjustable to suit road junctions, curves, etc. These reflectors increase candle-power enormously, but it is essential that the correct fitting be used for any given position, and Messrs. Sugg have, therefore, published a booklet under the title "More Powerful Street Lighting by Directional Reflection," which gives full details of the reflectors, and a great deal of useful information on the conditions under which they should be used.

### INCANDESCENT OIL LAMPS.

The Tilley Lamp Company exhibited a selection of their British-made Paraffin-vapour Lamps, which burn ordinary paraffin, and are stated to furnish a light of 300 candle-power for six hours at a cost of one penny.

Amongst the special lamps exhibited were: —

The Tilley Floodlight Projector, which is now being widely adopted by engineers, public works contractors, railways, etc. This gives a light of 1,000 candle-power and burns for 20 hours with one filling of oil.

The Storm Lantern, wind and rain-proof, yielding

300 candle-power.

The "Challow" Lamp, designed especially for the lighting of railway station platforms, but also

suitable for road and street lighting.

An Outdoor Suspension Lamp, similar to the above, but fitted with a 12-in. circular reflector. This is suitable for any form of outdoor illumination, and, as the oil container contains ½ gallon, the lamp requires a minimum of attention.

Other exhibits included an inspection lamp and a radiator for heating purposes, but burning paraffin in the same manner as the Tilley lamps.

### AUTOMATIC AND DISTANT CONTROL OF PUBLIC LAMPS.

In this final group there were six exhibitors.

The British, Foreign and Colonial Automatic Light **Controlling Co. Ltd.** showed a wide range of the well-known "Gunfire" gas controllers and electric time-switches for the automatic lighting and extinguishing of street lamps. Included in the display of controllers suitable for every type of lamp was a specially constructed controller (Type C/L) for main-tap operation, and provided with a cut-out device to obviate operation on Sunday or any other specified day. Electric time-switches, varying in capacity from 5 to 60 amps., were also shown.

The Gas Meter Co. Ltd. demonstrated the familiar "London" Clock Controller for street lighting, shop lighting and industrial purposes. The "London" Controller can, for instance, save much time by automatically lighting up gas fires before operators start work in the morning. The "Kingsoperators start work in the morning. The "Kings-land" controller (having a single train, as compared with the double train fitted to the movements of the London") was another well-known type of controller shown at this stand.

The Horstmann Gear Co. Ltd. exhibited the familiar "Newbridge" controllers, the design of which differs in respect of detail refinements from those supplied in the past. These controllers are proving increasingly popular. It is stated that nearly 40,000 were supplied during the past financial year.

The "Equinox" by-pass head used for ignition is, however, of considerable interest. In consists of an all-metal heavily chromium-plated cup into which is riveted a jet of pure platinum. The latter material is, of course, absolutely immune from corrosion or carburization, whilst the head being of all-metal construction is immune from fracture even when tightly screwed to the pilot tube.

On the other hand, those engineers to whom bypasses of any kind are anathema will find great interest in the "Newbridge" gas controllers with electro-catalytic ignition. Applied to the well-known Type 3A/UNI controller, this form of ignition has been most rigorously tested by the makers over a period of nearly two years.

The system employs an "electro-catalytic" igniter consisting of a platinum-alloy filament protected by a sheath of special design. At the same movement as the gas is turned on by the controller this filament is pre-heated by a 3-volt battery. gas is led to the filament by means of a neat scoop and immediately it impinges on the filament the latter glows intensely and causes the gas to ignite. The battery circuit is automatically cut off after a 3-5 seconds pause, and tests made for battery life indicate that this is at least seven months.

range of ironclad controllers for suspension and harp lamps was also on view, and on the electrical side an interesting exhibit was the "Newbridge" 35-42-day hand-wound time-switch with Solar dial for unit street lamps. The Solar dial fitted is extremely simple, and can be made to follow any desired lighting and extinguishing schedule.

The exhibit of Metropolitan Gas Meters Ltd. comprises a series of lamps operated by a number of the well-known "Duplex" controllers. The "Duplex" controller is exceedingly simple in operation, though it performs many functions. It is instantaneous in action, and it can be set to operate once or twice in 24 hours at will (no parts to be removed or attached). It can also be set to light up at any time and to extinguish at any time after an interval of two hours; or to light up again at any time after an interval of a minimum of one hour and extinguish again any time after an interval of two hours. by-pass is extinguished during lighting hours.

Further advantages of the apparatus are: It can be turned on by hand if desired without disturbing the normal sequence of operations. It will work equally well in any position. It is small (the height from the base of the socket to the burner nipple can be made as low as  $2\frac{1}{2}$  ins.). It has a large clear dial, and can be set with accuracy. Vibration of any and can be set with accuracy. description will not cause the mechanism to operate prematurely. It is entirely enclosed in a perfectly dust and insect-proof case.

An exceedingly interesting and relatively novel system of automatic control was that shown by Radio-Visor Parent Ltd., which is based on the light-sensitive action of a special bridge. Both A.C. and D.C. lighting units operating in various capacities were shown. Important improvements in design have recently been made. For example, the marked improvements in this type of unit are as follows: (1) The actual relay circuit and components can be removed from the case by merely sliding them out

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through the open door, the whole being mounted on brackets which adjust themselves to the walls of the case; (2) more minute adjustment is obtainable; (3) new designs in cases are available for both wall type and sprigot cap mountings on lamp standards.

An even more efficient unit can now be produced at a lower cost.

Many more Corporations and electrical undertakings have recently extended the use of this con-control, sometimes hundreds of lamps being controlled in one district by these means. It has also been found most efficacious for controlling "Danger" and "Keep Left," etc., signs at crossroads, both in the country and in town.

Modifications of these units are shown, whereby the signs (so described) can be illuminated by the passage of a vehicle or a person.

Attention is called to the use of this type of unit for the control of shop lighting after closing hours, to enable a policeman on his beat to inspect the shop by merely shining his lantern on the Radio-Visor Light-sensitive Bridge, which is concealed in a convenient place in the window, and lighting up the whole of the interior.

Finally, attention may be drawn to the display by Venner Time Switches Ltd. of automatic time switches for street lighting, which included handwound clocks of various length of run per winding, self - winding clocks, relays - including dualfrequency types and slow-running (200 r.p.m.) selfstarting synchronous motors.

On this stand was also shown a full range of switchgears for controlling single, double, change-over and grouped circuits with and without Solar dials, and in a range of carefully designed weatherproof boxes suitable for wall, pole and column mounting.

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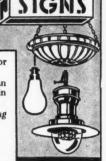
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The casing is of heavy gauge polished copper, and the reflector of 20 S.W.G. enamelled steel. The two rings with their hinge and catch for accommodating the globe are of cast brass, as is also the Superheater burner box.

The rings, burner box, and the external fittings are aluminium, metalised to prevent corrosion. All burner fittings are of solid brass, and the gas and air regulators are operated from the outside of the lamp. The supporting arms are of  $\frac{3}{4}$ " steam barrel, with wrought-iron scrolls, and the base of soft grey cast-iron. The base of the lamp shown is designed to house a clock-work controller, but a smaller cast-iron base can be supplied with a lever-cock only, when controller is not required. These lamps can be supplied in sizes to have 4, 5, 6, 7, 8, 9 or 10 mantles.

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# Correspondence

Sir.

G.V.D. ILLUMINATORS.

In your issue of August, 1932, on page 208, you give particulars of a new range of fittings, and at the end of the first paragraph the following appears: "It is contended a 100-watt lamp, used in a fitting of this nature, will adequately illuminate a room 20 ft. square."

In B.S.S. 161-1932 a 230-volt 100-watt lamp is rated 1160 lumens. The area considered is 400 square at 1160 lumens. feet. Therefore, at 100 per cent. utilization efficiency (that is to say, every lumen emitted by the lamp reaches the working plane) the average illumination produced with a 100-watt lamp in this area is 2.9 foot-

With a single fitting in a room of this size and producing a pleasing lighting effect, a higher utilization efficiency than 60 per cent. is not to be expected, which would reduce the illumination to 1.7 foot-candles. Is this adequate illumination? Assuming this is an office, modern practice is to provide 8 foot-candles. Yours faithfully,
HOWARD LONG.

Sir,

Mr. Howard Long, in the letter appearing above, recognizes the possibility of attaining 1.7 foot-candles with a single 100-watt lamp, and in favourable circumstances, such as exist with the fitting mentioned, an average illumination of 2 foot-candles or more is quite The illumination at selected points would naturally be more.

Surely it is not unreasonable to speak of this as adequate illumination, in the sense that it satisfies general requirements. Naturally if exacting work is to be carried out higher illuminations may be needed, though in reality the needs of the eye demand judicious distribution of light, rather than very high intensities. Supplementary high illuminations, of course, can be readily secured by other forms of G.V.D. illuminators. The trough fitting described is not intended to furnish strong local illumination for industrial purposes or even for sustained clerical work, but merely to produce a soft and pleasing lighting effect in a living room, which most people would consider ample. Yours faithfully,
G. V. DOWNER.



The Wolf Safety Lamp Co. 19

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ELECTRIC HAND LAMPS with Wolf Alkaline ators for Mines, Railways, and General Purposes. ACETYLENE LAMPS (150 models).

# Literature on Lighting

(Abstracts of recent articles on Illumination and Photometry in the Technical Press)

(Continued from Page 220, September, 1932).

Abstracts are classified under the following headings: I, Radiation and General Physics; II, Photometry; III, Sources of Light; IV, Lighting Equipment; V, Applications of Light; VI, Miscellaneous. The following, whose initials appear under the items for which they were responsible, have already assisted in the compilation of abstracts: Miss E. S. Barclay-Smith, Mr. W. Barnett, Mr. S. S. Beggs, Mr. F. J. C. Brookes, Mr. H. Buckley, Mr. L. J. Collier, Mr. H. M. Cotterill, Mr. J. S. Dow, Dr. S. English, Dr. T. H. Harrison, Mr. C. A. Morton, Mr. G. S. Robinson, Mr. J. M. Waldram, Mr. W. C. M. Whittle and Mr. G. H. Wilson. Abstracts cover the month preceding the date of publication. When desired by readers we will gladly endeavour to obtain copies of journals containing any articles abstracted and will supply them at cost.—ED.

# I.-RADIATION AND GENERAL PHYSICS.

# 238. Electric Discharges in Gases at Low Pressures. Irving Langmuir.

Frank. Inst. J., 214, pp. 275-298, September, 1932.

Consideration of the behaviour of electrons and positive ions, and the fields produced by their motion, is shown to lead to correct interpretation of discharge phenomena. The production of a relatively field-free region is discussed, and the motions of electrons and positive ions therein. Regions of strong field are also considered, and a theory of the positive column given.

S. S. B.

## II.-PHOTOMETRY.

# 239. On an Artifice Augmenting the Precision of Visual Spectrophotometric Measurements. P. Vaillant.

Comptes Rendus, 195, pp. 487-488, August 29th, 1932.

Greater precision is obtained by superposing a beam of appropriate intensity and colour on both comparison fields, the colour contrast more than compensating for the diminution in brightness contrast.

S. S. B.

# 240. Corrections for Slit-width in Spectrophotometric and Pyrometric Measurements. Ribaud and Peyches.

Rev. d'Optique, Vol. 11, Nos. 6-7, p. 241, June-July, 1932.

The effect of slit-width in spectrophotometric work may introduce errors if the transmission curve of the specimen is not linear over the range of wavelength admitted by the slits. A correction to the mean wavelength of the band admitted is given, of the form  $\Delta\lambda = (b_1 - v_1)_{-8}$ , where  $b_1$  is the relative variation of brightness of the source used, and  $v_1$  the relative variation of the visibility factor of the eye, per unit wavelength, and a is the spectral width common to both slits. The above formula applies to transmission factor determinations; similar expressions are given for the determination of the relative monochromatic intensities of two sources.

## III.—SOURCES OF LIGHT.

### 241. Sodium Vapour Lamp under Development Here. Anon.

El. World, 100, p. 233, August 20th, 1932.

Progress in the production of high-efficiency sodium-vapour tubes is briefly described. A special glass, having a high resistance to sodium vapour attack is being produced.

W. C. M. W.

# 242. Cleaning Arc Lamp Reflectors. Anon.

El. World, 100, p. 254, August 20th, 1932.

Describes a process for removing the brown deposit from arc and incandescent lamp streetlighting reflectors.

W. C. M. W.

# V .- APPLICATIONS OF LIGHT.

# 243. The Value of Agricultural Lighting. Anon.

El. Times, 82, pp. 285-289, September 8th, 1932.

The value of architectural lighting is based primarily on effectiveness rather than the delivery of a certain illumination for utility purposes. The author quotes numerous instances in order to show how an increase in load of about 50 per cent. follows the introduction of architectural lighting. The load from a supply engineer's view is worth consideration, and as architectural lighting is often on during the day as well as during darkness, special terms can be arranged. Illustrations of this mode of lighting are presented.

G. S. R.

### 244. Street Lighting.—Anon.

World Power, 18, pp. 154-157, September, 1932.

Progress in street lighting, especially in relation to street accidents, is reviewed. Developments in electric lamps and lanterns are summarized, and photographs of recent installations are presented.

C. A. M.

# 245. Examples of Electric Street Lighting. Anon.

El. Times, 82, pp. 324-326, September 15th, 1932.

The article contains illustrations of up-to-date street-lighting installations in London and provincial towns, together with details of the special problems involved in each case, and the class, spacing and type of installation adopted.

G. S. R.

# 246. Improved Lighting at Scarborough. Anon-

Elect., 109, p. 293, September 2nd, 1932; El. Review, 111, p. 322, September 2nd, 1932.

Illustrated descriptions of the new public lighting at Scarborough. C. A. M.

### 247. Code Stills Tendency to Curtail Street Lighting. H. Sharp.

El. World, 100, p. 312, September 3rd, 1932.

Shows how the introduction of the street-lighting code by the American I.E.S. has reduced the tendency of municipal authorities to curtail expenditure on public lighting. Five large installations, based on the principles of the Code, which were completed last year, have proved completely successful.

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# 248. Street Lighting Costs Analysed for Town of 5,000. Anon.

El. World, 100, p. 190, August 6th, 1932.

The cost of lighting the streets of Exeter, N.H., U.S.A., for a period of one year is analysed. 449 lamps are in service, and a series system is utilized. W. C. M. W.

# 249. Photo-electric Control of Street Lighting. 0. Dworeck.

A.E.G. Mitt., pp. 103-105, March, 1932.

The circuit described uses four cells in parallel, which, with a gas-discharge tube relay, operates the switchgear.

G. H. W.

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# 250. "See" Levels in Lighting. M. Luckiesh.

El. World, 100, pp. 236-239, August 20th, 1932.

The author presents a brief survey of the new "science of seeing." He condemns present lighting practice as "primitive," and claims that a new era in lighting is at hand.

W. C. M. W.

# 251. Visibility of Targets Illuminated by a Searchlight. Yves Rocard.

Rev. d'Optique, Vol. 11, No. 5, May; and Nos. 6-7, June-July, pp. 193-211 and 242-278, 1932.

A mathematical investigation of the brightness and contrast presented by an object illuminated by a projector and viewed from a position near the projector, when the atmosphere is diffusing.

W. C. M. W.

### 252. Lighting the Garden. Alfred Paulus.

Elect. J., Vol. 29, No. 9, p. 411, September, 1932.

The lighting of gardens uses perhaps more of the art of illumination than its craft. Some of the secrets of effective garden lighting, and some of the pitfalls, are discussed, and the load possibilities briefly indicated. Illustrated.

J. M. W.

# 253. Good Lighting for the Skittle Alley.

Licht u. Lampe, 17, p. 264, 1932.

Deals with the special requirements for the illumination of skittle alleys, and recommends that lights should be placed centrally at about 2 m. height, and not more than 5 m. apart.

E. S. B-S.

# 254. Supply and Service. "Distribution."

Elect., 109, p. 227, and p. 248, August 19th and 26th, 1932.

The first of these articles discusses the various points to be considered in the adequate lighting of railway coaches; tubular lamps are recommended. The second article deals with the characteristics of hot-cathode lamps, and the desirable refinements of the ultimate commercial products.

C. A. M.

### VI. - MISCELLANEOUS.

## 255. Aluminium as a Reflector of Ultra-violet Radiation. M. Luckiesh.

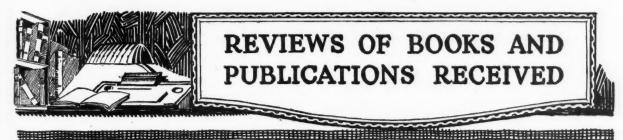
El. World, 100, p. 206, August 13th, 1932. Etched aluminium has higher reflection factors for visible and ultra-violet light than the unetched metal. A process of etching is described, producing a high reflection factor, which varies from 77 per cent. for  $\lambda = 2,654$  to 85 per cent. for  $\lambda = 3,663$ . W. C. M. W.

### 256. Photo-electric Relays. W. R. King.

Gen. El. Rev., 35, pp. 445-448, August, 1932.

Relays are described under photo-electric cells with Pliotron tubes alone, and also cells with Pliotron and Thyratron tubes. The characteristics of A.C. and D.C. forms are given. Values of illumination required for operation, which vary with the type of device, and values are stated.

G. H. W.



A HISTORY OF FIRE AND FLAME, by O. C. de C. Ellis (London: Simpkin, Marshall, Ltd., for the Poetry Lovers' Fellowship, 15s.; 1932.)

Although numerous books dealing with the history of chemistry and physics have dealt with the development of the various theories of combustion and of heat, we have none which consider the history of the ideas associated with fire and flame. Prehistoric man was familiar with fire and flame in forest fires and in various natural ways but it was a great day in the history of homo sapiens when he discovered the methods of making fire at his own volition. Dr. Ellis traces the development of his speculations on the wonder he had managed to harness. We are told how he venerated fire and came to worship it and are introduced to the part which fire and flame have played in symbolism, religion and religious ceremonial. We are told of the unicorn and the phœnix; of how fire was regarded as the principle of mobility in the universe; as the primal matter; as the principle common to all fuels; of fire as "igneous particles" and as the pabulum vitae which we now call oxygen.

Finally, in chapter nine, which is of great interest to illuminating engineers, he traces the development of public and private lighting and quotes interesting examples of the tendency throughout the ages to regard the invasion of the dark hours with artificial light as extravagent and reprehensible. Tiberus Gracchus, he writes, was upbraided that he permitted the most indigent and audacious of the people to follow him home at night with torches. Such a tendency to regard good illumination as an extravagance is still noticeable in these days. The rest of the chapter traces the history of gas lighting and street lighting to 1931 when "our

cities were the scene of some exceedingly elegant experiments in what may be called the footlight system, the actual source of light being itself hidden."

Chapter ten deals with the propagation of flame in explosions, with which the author is particularly well-qualified to deal. Finally in chapter eleven, the industrial harnessing of fire is considered and the author brings us back to the alchemist's dictum, "Our fire is water," as a foreshadowing of the development of electrical power from water power. Combustion, he says (though not all will agree), has served its purpose. It has taught us chemistry and given us electricity. Because of these lessons we know clean ways of storing and applying energy; ways which would allow us to harness that "fire which is not blown"—water power.

Dr. Ellis has written an encyclopædic book on the subject. He has done much condensing in order to cover his subject, but he is always interesting though one cannot read this book as one can a novel. His style is different from that of the usual scientific historian, probably on account of his gift of poetry. The dust cover tells us that the book is "rich and vivid" and that "every page is aglint with imagination." It certainly is so; perhaps only a poet could understand and explain the old alchemical and mystical writers as has been done by Dr. Ellis. H. B.

Street Lighting ... automatic control with negligible maintenance!

Particulars of Contactor System from -BROOKHIRST SWITCHGEAR LTD.,—CHESTER.



Fig. 1.-A General View showing the Floodlighting of Unilever House.

# The Floodlighting of Unilever House

Unilever House, London, the newest, and certainly one of the most remarkable structures in the metropolis, was opened by Sir Maurice Jenks, Lord Mayor of London, on July 18th, before an assembly representative of the civic, commercial, professional and industrial life of London.

It was built to serve as the headquarters of Unilever Ltd., Lever Bros. Ltd., and the United Africa Co. Ltd., to accommodate executive and staff numbering upwards of 4,000. It stands on the site of de Keyser's Hotel, a building erected by a former Lord Mayor of London, Sir Polydore de Keyser. The designs and plans of the present building were prepared by the Company's architect, Mr. J. Lomax Simpson, with whom Sir John Burnet, Tait and Lorne collaborated.

The G.E.C. was responsible for the floodlighting installation, which is the most extensive in the city of London. There are 110 floods employed in the scheme, each of which is equipped with a 500-watt Osram projector type lamp. The units are disposed along an upper and lower balcony running the whole length of the building, and are spaced at approximately 5 ft. intervals. A pleasing shadow effect is introduced on to the columns, which are approximately 30 ft. high, owing to the fact that the lower floods are so located that their beams only strike the upper portion of the columns. This introduction of shadow on the lower half of the columns is exceedingly picturesque, introducing relief and preventing anything in the nature of flatness in the floodlighting.

The floodlights are of the well-known G.E.C. Olympia pattern, fitted with silver mirror-lined

reflectors and heat-resisting glass. The installation engineers were Messrs. Troughton & Young Ltd.

This example illustrates how well the new type of building, executed in light stone and of massive proportions, lends itself to floodlighting. The nature of the lighting should, however, be adapted to the type of frontage illuminated, and it is very desirable that provision for floodlighting should be made at an early stage in the design.



Fig. 2.-Another View showing the graceful curve of the frontage of the building.

